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# High-voltage Jointing

## Rapid Action in Emergency

ONE of the more obvious risks to electricity supply continuity in time of war, as well as the one to be most frequently expected, is the damage that might be done to cables by the haphazard dropping of high-explosive bombs in the streets. The higher the voltages at which the cables are operated, the more serious are the consequences likely to be, owing both to the greater number of consumers affected and also to the longer time required for carrying out repairs.

There is another outstanding consideration and that is that steps are being taken to provide a reserve of electrical equipment at various centres with a view to replacing plant items that might be destroyed by enemy action. Now, the time in which a high-voltage switchboard, for instance, could be erected in such circumstances may be not much more than a quarter of that entailed in making a 33-kV joint and this discrepancy goes far to neutralise the advantages of expeditious erection in the first case. This has been a cause of concern to supply engineers, and although cable makers are known to have in hand schemes for reducing the delays these have, hitherto, not gone anything like far enough.

### Practical Demonstration

In order that switchgear and cable work may have a comparable time basis, it should be possible to switch in a 33-kV cable within two hours from the starting of work on a straight-through joint, while making off the sealing ends should occupy not more than half an hour each. Within the last few days we have had an opportunity of attending a demonstration held at the C.E.B. sub-station at Oxford of rapid high-voltage jointing that gives promise of meeting these requirements. It consists merely in the extension of the application of cold-filling compound (recently introduced for low-voltage work with quite a different object in view) to high-voltage paper-insulated cables. The chief point about it is that no appreciable shrinkage of the compound takes place, no voids are created and no time is lost in topping up, the cables being made alive as soon as jointing is complete.

The needs of the times have led to its consideration for far more ambitious duties, and during the past three months investigations into its ability to withstand 33 kV and higher voltages in service conditions have been carried out at Henley's research laboratories, and after running for a month at 33 kV between phases no deterioration could be detected. Although the times at Oxford were rather longer than those suggested as the most desirable, we are informed by Messrs. Kennedy and Donkin, the consulting engineers, who have had the question of means for rapid jointing under consideration on behalf of the Central Electricity Board, that "bogey" has actually been beaten at Greenwich.

### Further Speeding-up Possible

Conditions were not made too easy at Oxford and a better showing could have been made if other men had been put on to mix the compound first before the completion of the joint, and if the arrangements for doing so had been on a more adequate scale for speedy work. The former may not be practicable in emergency, but presumably the latter cause of delay can be easily corrected.

While this method of jointing is to be standardised by the Cable Makers' Association for permanent operation at voltages up to and including 11 kV, there is a disposition at present to regard it as a temporary expedient (but good for several months) for the higher voltages. There appears, however, no inherent reason, judging by performance so far, to suppose that it would not stand up to its work even up to 66 kV for an unlimited time, but in that event some improvement on the present wooden "coffin" as a joint box seems to be called for.

This brings us to the point that always has to be borne in mind in A.R.P. schemes. How far can they be regarded as means to improve normal working conditions? The national emergency has caused some rapid thinking among electrical engineers regarding the extraction of good out of evil, and the pace at which the supply industry is progressing in the direction of increasing security and safety has perceptibly accelerated of late.

Thus, methods of high-voltage jointing that have been devised as a contribution towards national defence, are likely to provide also a much-needed means of rapidly restoring normal conditions after a breakdown due to ordinary causes, as well as giving a new technique in the laying and maintenance of transmission and distribution mains that will result in a saving of time and money.

**Co-operative Switchgear Testing**

WE have in Great Britain four short-circuit testing stations of a much greater capacity than is to be found in any other country. These have placed their owners and other manufacturers for whom they carry out tests in the position of being able to supply high-voltage circuit breakers of a definitely ascertained service rating. The growing demand for type-tested switchgear called for an arrangement on more standardised lines, and the Department of Scientific and Industrial Research investigated ways and means. The Department finally decided to utilise to the fullest extent the existing stations under the ægis of the National Physical Laboratory working in conjunction with the station owners, now formed into a non-profit-making body under the name of "Asta." The decision was, we consider, a wise one, as not only are the overhead and development charges on such stations heavy, but the experience gained in their use since the late H. W. Clothier described the first of them in our columns nine years ago, is needed for obtaining the best results. Since the knowledge gained from this experience influences design and thus puts the owners of the stations in a somewhat privileged position, we suggest that these latter should add to their obligations the duty of presenting full data on the subject to the industry as a whole.

**Manufacture in the Dominions**

IN our leading article of May 19th we referred to the growing tendency of the Dominions to set up their own factories to the detriment of this country's export trade. We pointed out that Canada and Australia were going even further and exporting to other parts of the Empire. An outstanding example of this trend was mentioned by Mr. A. T. Johnson at last week's meeting of Richard Johnson and Nephew, Ltd. He said that the New Zealand Government had decided to place its general wire contract in Australia, which was aided by the exchange position. He considered this a "dangerous precedent," and "a calamity which could and should have been avoided." Another matter to which Mr. Johnson referred was the loss of business caused by the abandonment of tramways in favour of motor buses. This is another "dangerous" tendency which the electrical industry must continue to combat.

**Title Reduction**

BY the passing of the North Metropolitan Electric Power Supply Company's Bill last week sanction has been given to the accepted abbreviation of the company's title to "Northmet Company." Thus a good example has been set to a number of other electricity supply concerns whose titles need trimming, particularly those who operate in extensive areas and feel compelled to adopt a name descriptive of those areas. How wearying it is to such authorities and the public to have to repeat these geographical exercises. Our sympathies go out, for instance, to the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board; the Shropshire, Worcestershire and Staffordshire Electric Power Company; the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Company; and the London and Home Counties Joint Electricity Authority. These and others suffering from this sesquipedalian nomenclature (we have become affected ourselves!) should offer prizes for the best abbreviated versions of their titles, the cost to be met by the economies thus effected.

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**The Reheat Cycle**

PERHAPS the most remarkable feature of the Fuel Returns for 1938 is the way in which Dunston "B" station, after having wrested second place from Barking "B" in the previous year (when it was first run at a high load factor), has surpassed the performance at Battersea, and now stands at the head of the list with the best overall thermal efficiency yet recorded for a year's working in Great Britain. A good deal of the credit for this achievement must be given to the flue-gas reheating of steam between the high- and low-pressure cylinders of the turbines. Dunston B has smaller generating units than its immediate competitors and was put into commission as long ago as 1933. Its return of 27.85 per cent., based on kWh sent out, while only slightly more than Battersea's 27.63, represents an advance on the figures for Barking B and Fulham by more than the 5 per cent. usually expected from reheating. All four stations have similar initial steam conditions and load factors which, within a small margin, almost predestine future performances. Excellent as are their records, it can be prophesied with safety that to none of them will go the blue ribbon for the present year. High steam pressure and temperature at the reconditioned Brimsdown A (described in our last issue) have settled this point, for the present at any rate.

**Power Station Efficiencies**

LAST year thirty-one steam stations of authorised undertakings returned thermal efficiencies in excess of 20 per cent. Five years earlier the number was twenty-six, but this was based on kWh generated instead of sent out, as at present. Allowing for auxiliaries, the corresponding figure for 1938 would have been more than 40. Progress has been still better than this would show, however, as under interconnected operation the newer stations naturally tend to be given the best load factors, and nineteen of the stations returning over 20 per cent. efficiency, calculated on the old generation basis, did not run for the whole of the year. Yet most of these showed a small improvement over 1937 which helped to reduce the national average of fuel consumed from 1.51 to 1.45 lb. per kWh sent out. In some cases the effect of new plant was evident, notably at Dalmarnock (Glasgow), where there was an advance from 18 to 23.55 per cent., and at Neepsend (Sheffield), which rose from 17.9 to 20.61 per cent.

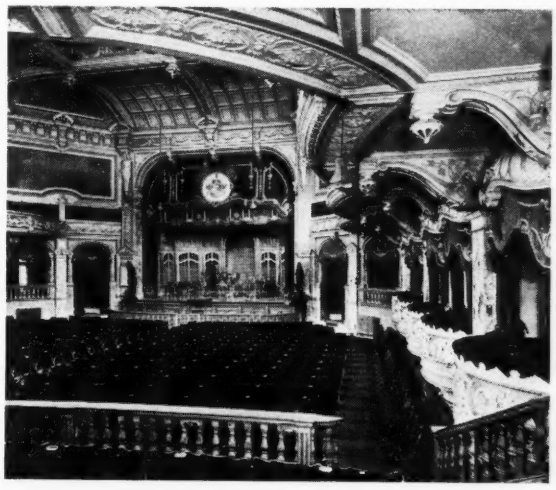
**Finchley's Finances**

THE anxiety at Finchley over the financial stability of the electricity undertaking must inevitably have been linked in the minds of many with the bold sales development policy instituted by the Council two or three years ago, especially the "free cooker" scheme, on the legality of which some doubts were expressed. Last July the Council appointed a special committee to investigate the affairs of the undertaking and its report, just issued, shows that the development policy was fully justified and commercially sound. The reason for the deficit of £17,516 on the 1937-38 year's working and others foreshadowed is the heavy capital expenditure necessary to meet the growth of the undertaking, which had not been fully anticipated by the Council, and the necessity for replacing obsolete plant and improving the distribution system. It is considered that the steps taken reflect great credit on Mr. Westlake, the general manager and engineer, and his staff, and it is felt that ultimately the result will be remunerative and of lasting benefit.

# HARROGATE

## What I.M.E.A. Delegates Will See Next Week

BY the courtesy of Mr. Neil McLean, borough electrical engineer and manager of the Harrogate electricity undertaking, and with a view to being able to point out in advance items of electrical and general interest to I.M.E.A. delegates next week and indeed for electrical visitors at any time, we recently spent a few days in the district. If the weather next week is nearly as good as we had at Harrogate and Mr. McLean and his chief assistant, Mr. A. Kelso, are in as good form as they were during our last visit, then the convention will have the right setting for success, for we should say that the town is an ideal one in which to hold a conference.



**The business sessions of the I.M.E.A. Convention are to be held in the Royal Hall depicted here**

It is a town possessing great open spaces, notably the Stray, a common land of 200 acres which one seems to strike in all directions, and the Valley Gardens which quietly diffuse at one end into the moors, and although a population of only about 40,000 spread over such a large area must present many difficulties to the electricity undertaking from the point of view of economical distribution, we believe supply engineers will agree that the trouble taken has been worth while.

**An aerial view of the handsome town, and right "The Stray"**

As we shall see later, the large number of hotels in the town also present unusual difficulties from the electricity supply point of view, but here again is another great advantage from the convention "angle." Facilities for most forms of sport abound. Music, dancing and entertainment are provided in rich settings and there is a shopping centre with a note of dignity that Harrogate alone can impart. The famous Royal Hall where the business sessions will be held, the Majestic Hotel which should make a splendid convention headquarters, the modern municipal offices and the Royal Baths which are now being extended, are among the many distinctive buildings to be floodlighted next week. It is, of course, as a spa that Harrogate has won its greatest fame and the Royal Baths, where the manager, Mr. H. Roberts, told us that all treatments will be available to delegates at half price, appear to be the centre of the "cure."

While I.M.E.A. delegates usually look far too robust to want to take advantage of such a good offer they should not miss the opportunity to see something of the comprehensive equipment for electrical treatment within these baths. We saw, *inter alia*, excellent installations for local and general applications of ultra violet rays and high-frequency current. A Bergonie treatment installation on which the patient receives galvanic and faradic stimulation of the muscles and a radiant heat bath with its many carbon lamps around the interior and supplementary ultra-violet lamps at the corners of the cabinet.

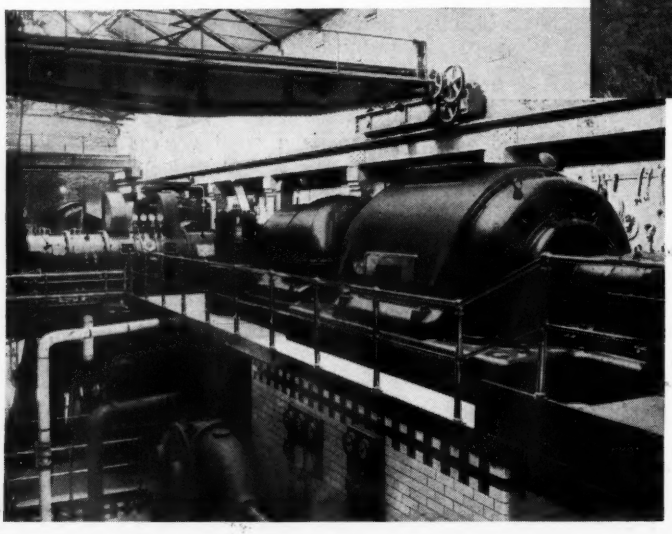
There is a great deal of interest to attract the visitor in the neighbouring town of Knaresborough with its wonderful old castle ruins, the old Court House where the prisoner entered the dock from below through a trapdoor in the floor, the water-wheel driven linen mill which has functioned for three or four centuries, and the oldest chemist's shop in England. But it was the striking viaduct over the River Nidd which held our attention most. It has four arches, two over the river and one on either side at the bank and is best seen from the castle ruins.

The generating station at Harrogate is "selected" and operates as a peak load station under C.E.B. direction, and bulk supply exchange is afforded by a simple grid sub-station with two 10,000-kVA transformers supplied by a double-circuit 66-kV steel-tower spur line from the Leeds generating station at Kirkstall. Tap changing for these grid transformers is controlled from the Harrogate station control board and the transformers are coupled direct to the line at the terminal pole *via* underground cable, *i.e.*, without circuit-breakers at the Harrogate end. The generating station is situated in the district of Oakdale on the bank of the Oak Beck, a branch waterway of the River Nidd.

### The Boiler House

Coal is received by road and from a storage dump is conveyed to a stationary bucket elevator feeding the boiler hoppers *via* a below-ground chute. There are also two 50,000-lb. per hour Yarrow four-drum land type boilers with Bennis chain-grate stokers and Green economisers. They discharge into a 150-ft. steel chimney and there is a small forced draught fan for each boiler in the ash basement. On each of these boilers there is a system of pipe-work incorporating a small chamber with a steam injector which gets the boiler water into circulation quickly when it is required to start up the boiler at short notice. There are also still in existence two Lancashire and two Yorkshire boilers; the former are used as feed-water heaters for the large boilers by means of a heat exchanger in the feed-water tank to which is supplied condensate from the generating sets and make-up from the undertaking's reservoir on the moors.

These boilers discharge into a 120-ft. brick chimney and there is an induced-draught fan at the foot of the stack. The steam conditions for the two Yarrow boilers and the largest turbo-alternator are 350 lb. per sq. in. and 730 deg. F., while the other boilers and the remaining turbo-alternators operate at 180 lb. per sq. in. and 500 deg. F. In the station range between the largest and the other turbo-alternator there is a Hopkinson reducing valve, and all the turbo-alternators are normally supplied from the more modern boilers.

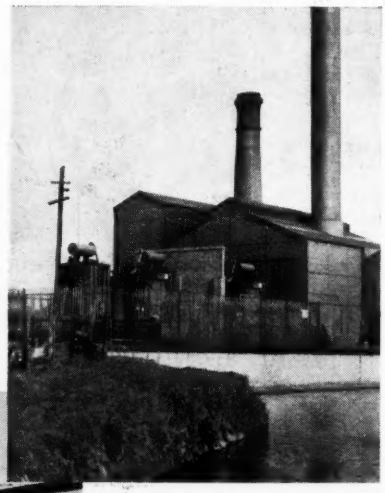


**Turbine room at Harrogate power station showing 1,500 kW and (rear) 8,000 kW set. Part of the station itself is seen in the inset**

### Generating Plant

The largest turbo-alternator is an 8,000-kW Parsons set with a motor-driven extraction and circulator condenser pump. A 1,500-kW G.E.C.-Fraser & Chalmers turbo-alternator has been built up on the condenser of a replaced vertical turbine and the original DC auxiliaries are still in existence and supplied by a steam-driven motor generator. The remaining two sets are a 4,500-kW G.E.C.-Fraser & Chalmers unit with steam-driven circulation and extraction pumps and an 1,875-kW Brush-Ljungström set with compound-engine driven auxiliaries. There is a separate condenser for the auxiliaries of each set and the condensate is passed into the main condenser. Circulating water is pumped direct from and discharged to the Beck which is so dammed that in times of water shortage the condensing water can be recirculated *via* spray coolers. The supply from the Beck, however, does not set a limit upon generating at Harrogate because the nearby river Nidd provides, we should say, ample water for any demand which is likely to be called for from the district. Incidentally the Nidd water which is surface fed from the moors is extraordinarily clean with the result that in forty years it has not been necessary to draw a single condenser tube, while the boiler tubes are cleaned only once every ten months.

The 4,500-kW and 1,875-kW alternators were originally single-phase machines and during the rewinding their respective capacities were increased from 3,000 kW and 1,250 kW. The 8,000-kW set generates at 11 kV, while the other three sets generate at 3,460 V. There are separate 11,000-V and 3,460-V switchboards which are coupled through one 5,000-kVA and two 2,500-kVA outdoor transformers, and in view of the transformer tie the two switchboards are regarded as one for operation purposes. The two grid lines are also connected to the 11-kV board *via* the grid transformers.



### Distribution

Primary distribution in the town of Harrogate consists of two 11-kV 3-phase ring mains which link up twenty-six sub-stations. The mains are mainly 0.1-sq. in. underground cables, and they are largely protected by overload, directional and earth leakage relays. It is now the practice, however, to lay with e.h.v. mains seven-core pilot cables by which "Translay" relays can be operated, leaving reserve cores for such auxiliary services as telephones and alarms. The original 2,000-V single-phase system in the town remains and is supplied at selected points from the 11-kV system *via* 11-kV 3-phase to 3,460-V 3-phase/2,000-V single-phase transformers.

Practically all the low-voltage distributors are now fed from the 11-kV ring and the 2,000-V system serves directly the larger consumers, *i.e.*, hotels, boarding houses and large shops directly *via* individual transformers on the consumers' premises. Nearly all the low-voltage distributors are 0.2-sq. in. four-core cables and they are supplied from the sub-stations through high-rupturing-capacity cartridge fuses as the only form of protection. It is now the practice to install high-rupturing-capacity fuses in the service cut-out.

The sub-stations are all roomy and whether brick built or of the kiosk type they are all constructed or finished to preserve the amenities of the locality. An excellent illustration of this point is one painted white with gold relief, a scheme which would generally be obtrusive but which, in this case, merges into its setting. In many cases where it has not been possible to conceal outdoor transformers, they have been housed

in the sub-station structure. Sub-station equipment layout is simple with truck-type or, in later sub-stations, iron-clad compound-filled switchgear with in and out and transformer units, and cartridge fuse equipments, often of the tailless type, built up on an angle-iron frame with an air-break main switch for the low-voltage distributors, and where a 2,000-V feed is given with a simple three-way and neutral unit with cartridge fuses on the phases fed by a four-core cable from the transformer and serving two-core cables from each phase and neutral, respectively.

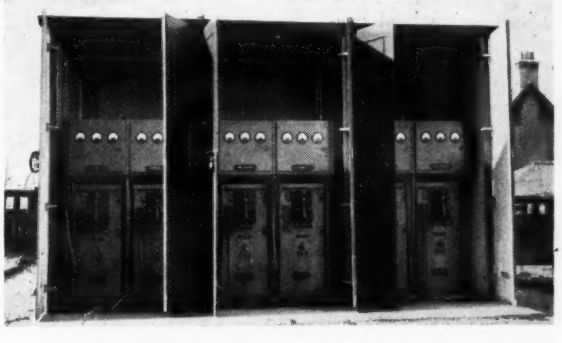
An excellent example of a kiosk "sub" is that which we were able to inspect at Pannal Ash where, within a structure about 15 ft. square, there is a six-panel 11-kV Ferguson Pailin board on one side with three double doors, and cartridge-fuse distribution units for 2,000 V and low-voltage supplies in separate compartments on the other side with two double doors, and at present two transformers of 150 kW and 250 kW in the centre. Actually there is accommodation for two 500-kW transformers inside and 1,000 kW of transformers outside.

At the sub-station behind the showroom in Knaresborough there is a five-panel horizontal isolation vertical examination 11-kV board supplied by the Harland Engineering Co., Ltd., as well as an outstanding example of low-voltage distribution gear. The low-voltage board with its cartridge-fuse units is arranged in two sections with a bus-bar coupler on each phase and a separate main switch for each section. The idea behind this scheme is that with the couplers open and each main switch fed from a transformer of appropriate voltage it will be a simple matter to transfer feeders from one section to the other as the change-over of voltage from 200 to 230 proceeds when such work is undertaken in the future.

Very roughly, the undertaking's area of supply of 296 sq. miles is rectangular, with Ripon towards the north east, Knaresborough towards the south-east, Middlesmoor towards the north-west and Summerbridge at the south-west. Distribution throughout the larger area is mainly by overhead lines with 0.1-sq. in. and 0.06-sq. in. copper conductors.

A major ring main with underground connections through Harrogate and Knaresborough and Ripon connects Harrogate - Bishop Thornton - Grantley - Ripon-Bishop Monkton - Staveley-Knaresborough-Harrogate. This main has an interconnector from a point near Bishop Monkton on the east leg and a point near Harrogate on the west leg, so that it may be regarded as two south and north rings. From the west leg a few miles north of Harrogate a distributor runs out to the north-west *via* Birstwith, Summerbridge, Wath and Middlesmoor. Spurs are taken off the rings and distributor at many points and as load develops the scheme is allowed to grow to a design which aims at further ring mains in the load density areas in the future.

Brick and kiosk sub-stations fed from the overhead lines serve the villages and communities while pole transformer stations serve isolated consumers. The low-voltage lines are of simple four-wire and two-wire vertical formation and in some cases the lines have been run at the backs of houses. Throughout the whole area there are at the moment 75 miles of 11-kV and 36 miles of low-voltage overhead lines, and 62 miles of 11-kV, 53 miles of 3,460/2,000-V and 129 miles of low-voltage underground cable.



[*Elec. Rev.* photo.

**The large kiosk sub-station at Pannal Ash Road showing e.h.v. switchgear**

The distribution staff has recently been reorganised in such a way as to make it suitable for working under both peace and war conditions, so that the procedure to be followed in the event of a breakdown resulting from a thunderstorm is the same as that which would be likely to be the case of a breakdown arising from an air raid. There are four squads of men each with an engineer, jointer and mate, a linesman and mate, a fitter and mate and a driver, and in conjunction with a headquarters squad, consisting of Mr. Kelso as superintendent and relief engineer and Mr. S. C. Harling, the mains engineer, as control engineer and a driver and two store keepers. The gangs are so arranged that in the event of sickness of any one man of each gang the scheme would still function. Every man in each squad has received his A.R.P. certificate.

**Kiosk and terminal pole at Hampsthwaite**

### Load Building Aspects

There is an exceptionally large number of hotels and boarding houses in Harrogate and we were led to inquire what was their influence on the supply. Mr. McLean said that whereas the effect was a favourable one regarding lighting, because a good lighting load for the summer months has been developed, the effect from the point of view of space heating was unfortunate. Electric fires which are now found extensively in hotel bedrooms are not used during the summer months, but during the Christmas season they "come on" in great numbers during the "dressing for dinner" period or on the undertaking's peak.

Harrogate is probably unique in that there is no industry whatever within the borough. The ratio of the domestic to industrial loads for the whole area is 8 to 1. The largest "domestic" installation is the Grand Hotel, where the consumption last year was 253,795 kWh. The largest industrial and rural installation is the gravel quarry at Lingerfield of X.L. Quarries, Ltd., where 160,000 kWh was supplied last year at an average price of 0.94d. per kWh.

The 1938-39 load factor of the undertaking was 33.93 per cent., the maximum demand being 10,156 kW. The estimated energy sold to the 20,569 consumers is 26.81 million kWh and the average price received per kWh sold is 1,535d. The revenue for the year is £184,776 and the total capital expenditure on the undertaking to the end of the year is £1,349,500.

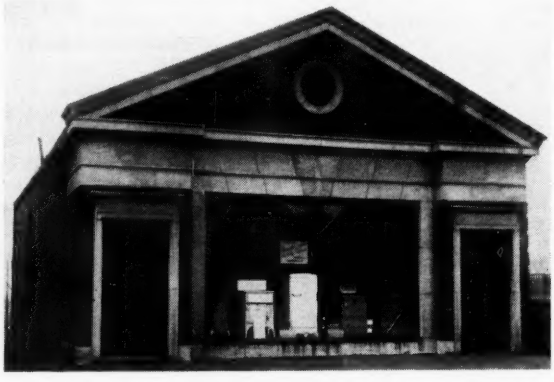
Since the Ripon undertaking was acquired by Harrogate in 1935 the consumers in the Ripon area have increased from 1,816 to 2,916, with a corresponding consumption increase from 617,288 kWh to 2.33 million kWh last year. At the same time the average price per kWh sold has been reduced from 2.7d. to 1.77d.

Apart from the all-in domestic and the maximum demand lighting tariffs the two-part system is not actually applied, but the other tariffs have been worked out on a two-part basis. The all-in domestic tariff has a 15 per cent. rateable value standing charge and a kWh charge of 0.5d. Other non-industrial tariffs in-

clude a lighting flat rate of 4d. per kWh; a sliding scale tariff for large heating and cooking installations of 400 kWh per annum per kW of maximum demand at 1d. per kWh and 0.5d. per kWh for all over 800 kWh; and a water-heating flat rate of 0.5d. per kWh. The sliding scale is also applied to power on the basis of 1 HP = 800 VA in the following manner: first 120 kWh per annum per HP at 2d., 600 kWh at 1d., 720 kWh at 0.75d., and ½d. per kWh for all over 1,440 kWh.

The headquarters of the undertaking are at the Municipal Offices. At the temporary showrooms in Harrogate and at the branch showrooms in Knaresborough and Ripon demonstrations of electric cooking and the use of other appliances are held regularly, while great importance is attached to giving free advice to consumers and prospective consumers on all electrical installation problems.

While no one class of load is regarded as more important than the other classes, water heating is given particular attention because of circumstances which may be peculiar to Harrogate. Every house in the town has a bathroom which is served by a fire-back boiler. Such conditions render it fairly easy to cultivate electric water heating with relatively small capital expenditure. Further, the load is almost entirely off-peak because the fuel-fired boilers are used during the winter. The principal method of encouragement is a low flat rate of 0.5d. per kWh. Almost universal use is made of the circulator which is easily and cheaply installed in the hot water cylinders. The circulators are hired out at 4s. per quarter and they are of the hand-controlled three-heat type with a pilot light. Plumbing work and up to 40 ft. of wiring are carried out without additional charges.



**Sub-station with showroom front at Starbeck**

The outstanding purity of the water at Harrogate is reflected in the very low maintenance costs. Last year the maintenance costs for water heating, including the replacement of pilot lamps and the time of men attending to complaints, averaged 8d. per water heater installed. The self-contained water heater does not appear to be greatly favoured by consumers on the score of economy. Storage heaters are hired at rates from 18s. per annum for a 2-gal. model including 30 ft. of wiring. There are at present 3,525 water heaters out on hire, including immersion heaters.

Regarding cooking, the undertaking has found in automatic oven temperature control a very useful means of reconditioning some of the earlier models in stock so as to render them suitable for re-issue. This practice does not apply to the modern type of cooker, however, and the fitting of thermostats generally has been avoided except where requests are made by consumers. There is not, however, a great call for automatic control in Harrogate and the re-equipping of the earlier models has not influenced the position to-day with regard to the fitting of thermostats on cookers.

On the control unit of every cooker installed is a 15-A three-pin socket outlet which is intended to serve a washboiler which can be hired at 3s. a quarter. By the use of a 15-A three-pin plug fused to 5 A the same outlet can be used for a kettle which can be hired at 1s. 6d. a quarter. The undertaking is finding a gradually increasing call for commercial baking ovens, particularly of the pastry type. Cooking equipment is provided and maintained free in schools for educational purposes, so that the rising population may grow up electrically minded.

Apart from supplementary heating by means of high-temperature fires, space heating in the purely domestic field has not yet made great headway in Harrogate, but there are some outstanding examples of electric space heating systems in large buildings. In the municipal offices, for instance, there is a 300-kW low-temperature heating system of wall panels and tubes, and similar heating installations in the Valley Gardens Pavilion and St. James's picture house have loadings of 100 kW and 68 kW, respectively. Considerable attention has been given to providing automatic stoking for fuel-fired boilers in large buildings for space heating, steam cooking and domestic hot water supplies. An underfeed stoker with a motor-driven worm conveyor is applied to the boiler and the motor is switched on and off by the operation of a thermostat. The result is a considerable electricity consumption, reduced stoking costs and the ability to use a lower grade of coal.

Since its institution in 1929, 2,475 houses have been wired under the assisted wiring scheme. Within the 296 square miles served by the undertaking, 227 farms are connected to the supply. As we have already said, all industries supplied by the undertaking are outside the borough and two main groups of industry may be classified as paint and varnish in Ripon and twine making and corn milling in the Nidd Valley, where considerable water power competition is encountered.

### The New Meter Testing Station

Many I.M.E.A. delegates will, no doubt, be interested in the new meter testing station which has recently been established at the undertaking's Homestead Road depôt. In it there are five main rooms, namely, receiving, reconditioning, instrument, testing and store. In the reconditioning room we saw an ingenious little machine for cleaning small component parts. These are placed in a gauze container at the end of the projected spindle of a tiny vertical motor, the complete arrangement being similar to that of the modern drink mixer. From an adjustable bracket arm the motor unit is turned about and raised and lowered along a vertical support so that the container can be inserted, in turn, into four jars, three of which contain cleaning solutions while the other is a drying chamber fitted with a heating element.

The instrument room is equipped with modern potentiometer gear for the testing of sub-standard instruments and there is a Venner pendulum master clock. In the test room proper there are eight benches, each 10 ft. long and accommodating about 18 meters. Each pair of benches is arranged in line with a Ferranti testing set at the centre. The testing set is surmounted by controls made by the undertaking and the equipment provides loads from 5 A to 100 A in six steps. Voltages from 0/600 are supplied by means of a moving coil regulator fed from the ordinary supply. There is also a separate Fuller testing set for handling non-standard meters.

Because of the pioneering work done at Harrogate in electric cremation, many delegates will be anxious to see the first equipment installed for this purpose in this country. The chamber to which the coffin is committed is equipped with ribbon elements on the roof and other elements are arranged in ducts underneath, through which air is passed and heated, before being ejected into the main chamber. Combustion takes place mainly in consequence of the injected hot air and the products of combustion pass through a separate electrically heated chamber in which they burn to invisible gases. Before being discharged, the gases are passed through a heat exchanger in which the incom-

ing combustion air supply for the furnace is pre-heated.

The incoming fresh air is blown through the heat exchanger into the furnace by a forced-draught fan, while an induced-draught fan draws the products of combustion through the smoke combustion chamber heat exchanger in the chimney. The heating elements are of 80/20 nickel chrome similar to those used in many industrial furnaces, and they are of very heavy cross-section. As all heating up is done before the coffin is inserted there is no risk of delay by element failure. The usual operating temperature is about 1,000 deg. C. and cremation is completed in about an hour.

For a cremation from stone cold the consumption is about 240 kWh. For a cremation one day after the furnace has been used the consumption falls to about 120 kWh, for a second cremation on any one day the consumption is about 20 kWh, and for a third and subsequent cremation the consumption is about 12 kWh. The furnace was manufactured by Birmingham Electrical Furnaces, Ltd., and it is controlled by Electroflo instruments in conjunction with Brookhirst contactor gear.

**Harewood House to which I.M.E.A. delegates are paying a visit**

### Suggested Tours

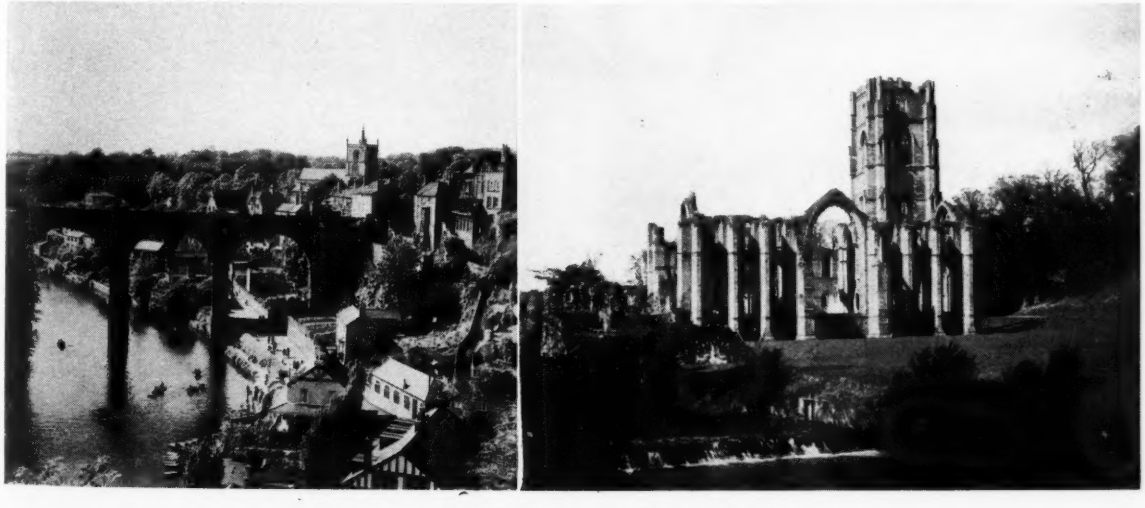
Most delegates like to explore the surroundings of the convention centre and here are a few suggested trips with much in electrical and general interest for which we are indebted to Mr. McLean and Mr. Kelso.

Proceeding north to Ripley we see its fine old castle inhabited by Sir William Ingleby, its church which carries the marks of bullets fired by Cromwell's soldiers when they executed some Royalist prisoners after the battle of Marston Moor and which has a leper window, some old stocks in the village square and a monument to the last boar killed in Knaresborough forest. Travelling west from Ripley one passes the estate at Hartwith-cum-Winsley, where underground distribution was made possible by cable laying in trenches opened for the purpose of laying water mains. At Hartwith the twine mill with electricity supply supplementing a water wheel drive can be seen and nearby there is a laundry where electricity is used in drives for washing, drying and ironing machines and a little further on there is a stretch of old Roman country with many discarded lead quarries and mines.

We are now in the Nidd Valley with Dacre and Summerbridge in view on the left. At Glasshouses, to which a supply is soon to be given, there is the largest waterwheel in this country. With a capacity of about 230 HP this wheel is about 27 ft. wide and 30 ft. in diameter. It can take the normal flow of the river and flow is controlled by raising and lowering leather aprons at the wheel inlet. In returning on the Birstwith Road a halt at Birstwith is well worth while to view the old Roman bridge over the Nidd. Some mounting steps in good preservation near by can also be seen and at Hampsthwaite there is an old cattle pound.

Another outing which should prove interesting to electrical men is to see the manufacture of presspahn at the paper mill of Butterfield and Renton, Ltd., at Bishop Monkton. The route is *via* Knaresborough, some attractions of which we have already referred to, and Copgrove, where Appleyards, Ltd., consumed 86,665 kWh last year in crushing cattle food and where the excellent buildings of Copgrove model farm are well worth a visit.

The raw materials for the production of presspahn are mainly jute in the form of botany and linter bagging and sulphate pulp in sheet form. The jute is first sorted for the elimination of metal and other foreign matter and is then chopped up on a machine with knives around a drum which revolve and cut against a bed-plate to give a rough disintegration of the material. The machine is driven by a 7½-HP motor. The broken-down material is then put into a steam-heated boiler with milk of lime and the boiler is revolved about a central shaft with a gear wheel which is driven from a worm. Steam is applied to the boiler through the shaft and the objects of this operation are cleansing, de-odorising, bleaching and tendering the fibre.



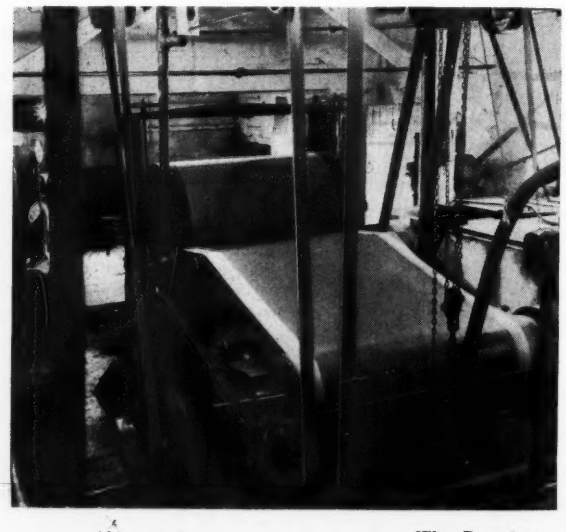
**Picturesque Knaresborough and Fountains Abbey**

With the sulphate pulp the mixture for the boiler is then transferred to beaters which are driven by 30- and 25-HP motors. In each beater a circular roll with knives around it, rotates against a bedplate also equipped with knives and the roll is slowly lowered on to the bedplate so that the fibre is gradually disintegrated. Pulp from the heaters flows into a stuff chest from which it is pumped up to a mixing vat where it is power agitated. It then flows down over sand traps where it is mixed with water and passes through a strainer to the mould vat at the end of the paper-making machine.

From the mould vat the fibre is picked up by the wire mould drum and is transferred by means of couch rolls to an endless belt from which the fibre is passed to the cylinder at the delivery end of the machine. The fibre gradually builds up on the cylinder until the required thickness of material is obtained. For the production of different sizes of sheet various sizes of cylinder are used, and longitudinally on the surface of each cylinder are a number of slots where cuts can be made according to the size of sheet required. Slots not required during any one operation are filled with lead. The paper-making machine is driven by a 12½-HP motor. The wet sheets are taken from the cylinder and built up, interleaved with cotton sheets, into packs of twelve sheets, each pack on a plate. The packs are treated in a hydraulically operated press which squeezes out the water and gives an even face to the sheets.

After being hung to dry for a few days in steam-heated lofts and then straightened and made flat, the sheets are surfaced in a rolling machine which has a free roll at the end of a pendulum arm, which imparts a smooth surface to the sheet. In a similar machine a fixed roll next imparts a hard polished friction finish to the sheet. It should be emphasised that high electrical properties are attained not by any major departure from the processes of millboard production but rather of meticulous care throughout in keeping the material free from conducting particles, in cleanliness and in the hardening.

Another short tour is to Lingerfield *via* Starbeck,



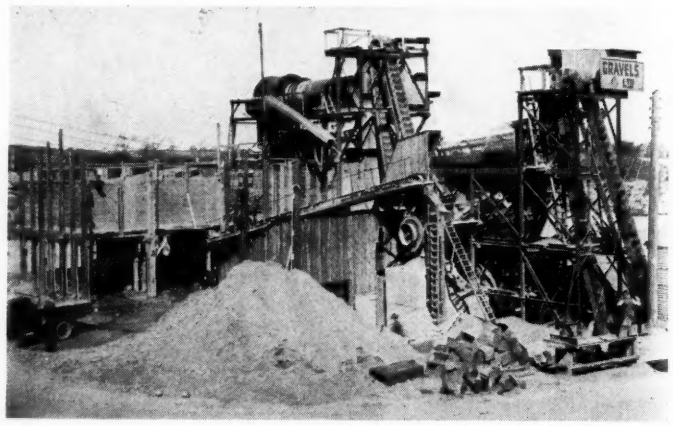
[*Elec. Rev. photo.*

**Sheet-making at Butterfield and Renton's factory**

where a large petrol storage station is being erected by the aid of electricity for welding and which will yield about 80 HP of pumping load, and back *via* Scotton. At Lingerfield there is a gravel quarry of X.L. Gravels, Ltd., where material removed from the quarry face by Diesel-driven navvies is delivered by road to the grading, crushing and washing plant on which a 120-HP motor drives two crushers and a small vibrator, a 35-HP motor drives a washer, a rotary screen and a 15-HP motor operates a small screen, an elevator and a feeding unit. The plant will handle 25 cwt. of good dry material per minute.

At Scotton there are some extensive tomato nurseries with, at present, 15,000 tomato plants in addition to marrow plants. The 14,400 ft. of 4-in. heating pipe throughout the glass houses is served by four boilers with automatically operated stokers of the type already referred to. The stoker motor is started and stopped by the thermostat in the greenhouse with a setting of, say, about 70 deg. F., but there is a master controller in the range near the boiler. The motor is also started up and run for five minutes per hour so that the fire shall not go out. The stoker motor also drives a fan for delivering air to the fire.

At the Meadow Farm, Chain Lane, near Knaresborough may be seen a 14-kW "Autoflo" electrode boiler invented by Mr. Harling, the mains engineer at Harrogate. It serves a sterilising chamber for bottles and utensils and also a bottle-washing equipment. The bottoms of the electrodes dip into cup so that when the water level is below the bottom of the electrodes arcing takes place between the water in the cups and thus prevents burning of the electrode points.




[*Elec. Rev. photo.*

**Grading, washing and crushing plant at XL gravel quarry**

## The Harrogate Programme

THE 44th Annual Convention of the Incorporated Municipal Electrical Association commences on Monday next with the registration of delegates. The details of the programme are as follows:—

*Monday, June 5th.*—8.45 p.m. Reception by the President (Mr. H. C. Lamb) and Mrs. Lamb at the Royal Hall, followed by dancing. 11.30 p.m. Cabaret.

*Tuesday, June 6th.*—10 a.m. at the Royal Hall. Civic welcome by the Mayor of Harrogate (Councillor H. Dawson) and presidential address. 1 p.m. Harrogate Rotary Club lunch at the Crown Hotel. 2.30 p.m. Royal Hall. Paper and discussion on "Some Practical Aspects of Electrical Development and Distribution," by Messrs. P. J. Robinson and E. L. Morland (Liverpool). 3 p.m. A talk on "Health and Harrogate" for the ladies, by Dr. Dorothy G. E. Potter at the Hotel Majestic. 8.45 for 9.15 p.m. Royal Hall, Concert and dance.

*Wednesday, June 7th.*—10 a.m. Royal Hall. Paper and discussion on "Some Financial Aspects of Municipal Electricity Supply," by Councillor A. Lester Boddington (Croydon). 2.15 p.m. Garden party at the invitation of the Manchester Electricity Committee. Visits to Fountains Abbey and Harewood House.

*Thursday, June 8th.*—10 a.m. Royal Hall. Paper and discussion on "Advertising and Publicity," by Mr. A. C. Cramb (E.D.A.). 1 p.m Queen Hotel. Luncheon organised by the E.A.W. 2.30 p.m. Royal Hall. Paper and discussion on "A.R.P. in Relation to Electricity Supply Undertakings," by Mr. J. M. Kennedy (Electricity Commission). 4 p.m. Valley Gardens. Tea for ladies and mannequin parade at the invitation of the Harrogate Electricity Committee. 7 for 7.30 p.m. Hotel Majestic. Annual banquet and ball. 11.30 p.m. Cabaret.

*Friday, June 9th.*—9.30 a.m. Royal Hall. Council meeting. 10.30 a.m. Ordinary general meeting. 2.15 p.m. Trips to Yorkshire Dales and Rowntree's Chocolate Factory, York. 8 p.m. Royal Hall. Variety concert.

*Saturday, June 10th.*—Visits to Kirkstall power station (Leeds Corporation) and Thornhill power station (Yorkshire Electric Power Co.).

# SOUTH AFRICAN ACTIVITY

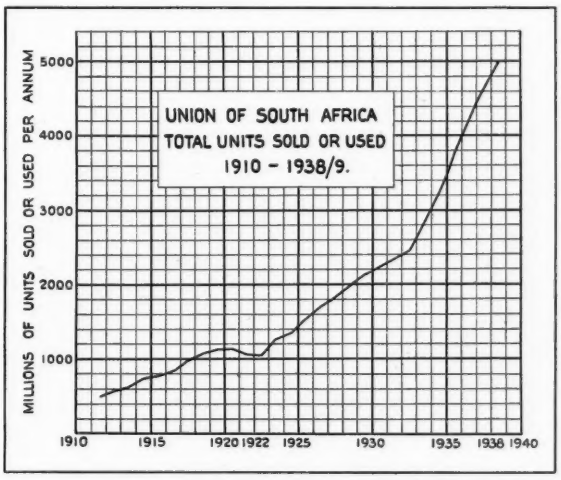
## Rapid and Continuing Development

By H. A. Eastman, A.M.I.E.E. (Capetown)

ONE of the most outstanding features of the present-day economic development of the Union of South Africa is the phenomenally rapid growth that has taken place during recent years in the supply of electricity for industrial as well as for domestic purposes. This is illustrated in the accompanying curve which shows the quantity of electrical energy sold or used in the Union during the past twenty-five years amounting at the present time to approximately 5,000 million kWh per annum.

The extent to which the Union of South Africa may be considered to be "electrified" may be judged by the fact that sales of electrical energy now amount to 1,670 kWh per annum per head of population (excluding natives), a figure which is about four times the corresponding figure for Great Britain and twice that for the United States of America, and even when the entire population of nearly eight million is taken into account the average annual consumption of electrical energy is in the region of 600 kWh per head and still continues to increase rapidly.

The relatively large total use of electrical energy is due primarily to the requirements for gold mining purposes which amount to about 3,000 million kWh per annum. This figure will increase considerably when the numerous mines now in course of development are brought to the production stage, but there is also a very substantial background of development in the use of electricity for other industries as well as for domestic purposes. Latterly the establishment of works for the manufacture of iron and steel and associated industries has given a strong fillip to the development of the use of electricity in the larger centres in the vicinity of the gold mines, whilst numerous relatively large factories with a wide variety of products for local consumption have been established also in the larger centres on the coastal belt, nearly all of which use electricity to the exclusion of any other form of motive power.




**Growth in electricity output in South Africa**

That South Africa is by no means backward in making use of electricity for domestic purposes may be judged by the fact that during the year 1935/6 (the latest for which detailed statistics are available) 232,826 consumers used an average of 1,693 kWh for this purpose alone. This is about twice the corresponding figure applying to much more densely populated countries overseas, and the extent to which this has developed in one of the most progressive of the municipal undertakings in the country is illustrated by the fact that in the City of Capetown the average consumption per annum per consumer for domestic lighting, heating and cooking during the year 1938 was no less than 3,370 kWh. This figure, moreover, is increasing rapidly.

The average price received by all undertakings from the sale of electricity is approximately 0.6d. per kWh. This relatively low figure is due mainly to the large proportion of total output that is sold to consumers with relatively high load factors from power stations at which the cost of fuel is very low, but even when supplies for such consumers, most of whom are gold mines and the Railway Administration for its electrified lines, are excluded, the average price received per kWh of 0.96d. cannot be regarded as unduly high as more than half of these supplies are given in centres remote from the coalfields with a fuel cost of the order of 26s. and upwards per 2,000 lb. by undertakings serving by no means densely populated areas.

**The Colenso power station of the S.A. Railways**

Notwithstanding the handicap of the high cost of coal at most of the coastal towns, the furthest of which from the collieries is Capetown, the undertaking charges large industrial consumers, such as those engaged in refrigeration and milling, only between 0.43d. and 0.6d. per kWh, whilst those factories whose plant is operated for twelve hours per day or less obtain supplies at an average price of between ¾d. and 1d. per kWh.

The total capital expenditure on the electricity supply industry at the present time is approximately £34,500,000, of which about half has been spent on municipally-owned undertakings. The industry provides employment for 13,000 persons and has a salaries and wages bill of nearly £2,000,000 per annum.

In 1922 South Africa followed the lead given in more highly developed countries by introducing legislation having as its object the directing of the supply industry along lines which would make for the maximum rate of progress. The Electricity Act brought into force in that year provided for the establishment of an Electricity Control Board, which is a licensing and controlling authority for all private electricity undertakings and the Electricity Supply Commission, the members of which are appointed by the Government but which, nevertheless, is a corporate body free from Parliamentary control and influence and is required to carry out its operations in the same way as a private concern.

**Electric trolley locomotive hauling ore in a Johannesburg gold mine**

To give effect to the principal object of the Act it includes as a fundamental principle that the Electricity Supply Commission, the largest of the undertakers licensed under the Act, shall operate its undertakings at neither a profit nor a loss and shall adjust its charges accordingly, whilst other licensees are required to refund each year to their consumers pro rata to their payments 25 per cent. of the surplus profits of the undertaking for that year, the tariff of charges of all licensees being subject to approval by the Control Board. The Act, however, does not in any way interfere with the conduct of a municipal undertaking in respect of supplies given in its own area of jurisdiction, this being a matter for control by the Administration of the Province in which it is situated.

In the carrying out of its functions of establishing and working undertakings for making efficient and economical supplies of electricity available the Commission has already established seven undertakings which include six power stations with a total generating capacity installed and on order of approximately 800,000 kW, about half of which is concentrated in one power station alone in the Transvaal and whose output is supplied almost wholly for mining purposes. The Commission has also under consideration the construction of yet another large power station in the Transvaal capable of extension to about the same capacity as its present-day largest station, namely, 400,000 kW, to meet the requirements of the expanding gold mining industry in the near future.

Of the privately-owned undertakings in the Union the largest is the Victoria Falls and Transvaal Power Co., Ltd., which with its subsidiary, the Rand Mines Power Company, Ltd., owns power stations with a total installed capacity of nearly 300,000 kW.

Although the quantity of electrical energy sold by the Electricity Supply Commission and the Victoria Falls Co. amounts to about 80 per cent. of the total used—most of which is supplied to a few large consumers—by far the greatest number of undertakings in the country are municipally owned. Indeed, there is only a small proportion of communities of 500 Europeans and upwards that either have not already established electricity undertakings of their own or who are not obtaining supplies from neighbouring concerns, and of those who are at the present time without this amenity it may confidently be said that they will obtain it as soon as it becomes at all practicable to do so.

## Important Extensions

Quite apart from the demands made for supplies for mining and industrial purposes depending primarily on the mining industry, demands for additional supplies for other purposes have been made during the past few years on an unprecedented scale so that it has become necessary to put in hand the construction of new power stations and to extend to their maximum capacity the existing power stations in most of the principal centres of the Union. The Capetown Municipality, for example, has recently constructed its Table Bay power station with an initial installed plant capacity of 120,000 kW and capable of expansion to 200,000 kW. The Johannesburg Municipality, whose present installed plant capacity is 82,000 kW, is constructing a new power station containing 90,000 kW of installed plant capacity and capable of expansion to 150,000 kW. The construction of a new power station at Port Elizabeth is under consideration and East London also is considering making extensions to its power station plant. In the smaller centres extensions to plant and equipment are being made in many places, and there is in addition a steady increase year by year in the number of small new undertakings.

It is a recognised principle in all the large centres where electrical wiring contractors are properly established in business that the municipal electricity undertaking will not engage in competition with them, and all undertakings have promulgated regulations, which have the force of law, dealing with the carrying out of electrical installation work in premises in which supplies are given from the undertaking itself. In some of the larger undertakings the regulations incorporate a provision to the effect that the latest edition of the I.E.E. Regulations for the Electrical Equipment of Buildings are to be read in conjunction with them, and to a very great extent the electricity supply regulations of the various municipalities have been standardised through action taken many years ago by the Association of Municipal Electricity Undertakings.

The larger centres have also introduced regulations providing for the licensing of electrical wiremen and the registration of electrical wiring contractors. The importance which is attached to this safeguard in the interests alike of the public and of the electricity supply industry is such that the Government has introduced a Bill dealing with this subject with the object of strengthening the legal position and of bringing about uniformity in this matter throughout the Union.

## Manufacture and Imports

So far only a few manufacturing industries have been established for the production of material used on a large scale by the electricity supply industry. Of these the principal concerns include one making electric cables and conductors, one making street poles and one making electric ranges, whilst the erection of a factory for the manufacture of electric lamps is under consideration. Accordingly nearly all materials used in the industry are imported. The total value of the imports under the heading "electrical material and machinery" during the year 1937 (the latest for which details have been published) amounted to nearly £6,000,000, and of this £3,800,000, or 64 per cent. of the total, was imported from Great Britain. The imports from Germany during the same period amounted to nearly £500,000 and of the remainder the greatest value of imported materials came from America and Canada.

Ordinarily tenders for plant and equipment required by supply authorities in South Africa are invited only through the medium of the South African Press, so that it is necessary, in order that prospective suppliers may be kept posted with the requirements from time to time, for them to be represented in at least one of the principal centres in the Union. Most of the largest British manufacturers of electrical plant and equipment are represented in this country by companies of the same or a similar name, and this applies also to several of the largest German and American electrical engineering concerns, whilst there are very few of the better known British, Continental and American firms who are not represented in this country by agents. In consequence, very great keenness in tendering is experienced, the degree of which may be judged by the fact that one of the larger electricity undertakings recently received no fewer than fifteen tenders for a number of transformers ranging from 300 to 1,000 kVA, of which nine were from British and six from Continental firms.

The South African Railways and Harbours Administration, which is one of the important buyers in this country, pursues a policy of using goods of local manufacture wherever compatible with its requirements, a principle which has been

adopted in the largest centres by the civic authorities also.

With regard to imported materials a tendency towards "buying British," which has existed in several of the larger municipalities for some time, has become more pronounced during the past twelve months, but the extent to which this is given effect is limited by the keenness of the competition that is met with.

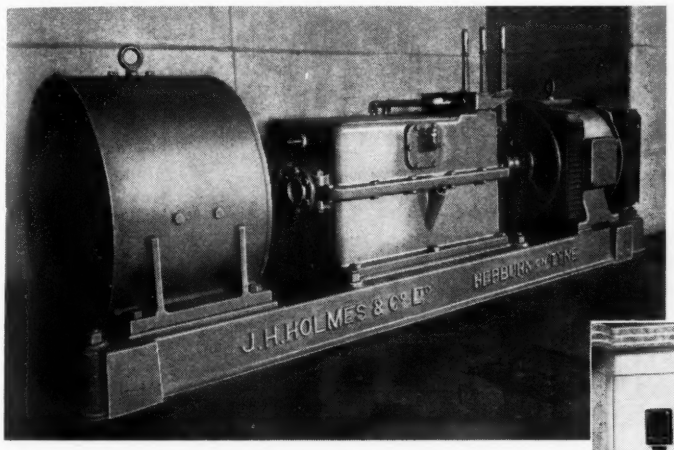
Preferential treatment is granted to goods manufactured in Great Britain and Northern Ireland, Canada and the Irish Free State, through the customs tariffs by giving a margin of preference of 5 per cent. duty over similar foreign-made goods which in respect of electrical machinery and equipment for the generation and transmission and distribution of electricity has the effect at the present time of allowing British manufactured articles to enter duty free, a minimum duty of 5 per cent. being charged on similar material imported from other nations. Dumping and exchange duties have been instituted for the protection of local industries, and whilst these apply to certain goods made in Great Britain, such as cement, rubber hose, piping, poles, &c., they do not apply to any appreciable extent to electrical plant and equipment.

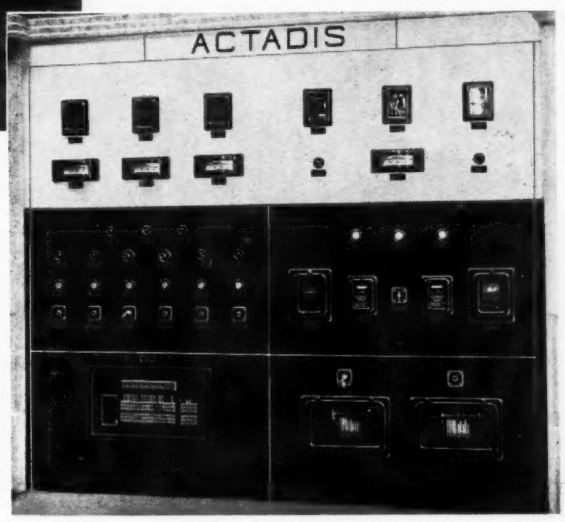
In general, it may be said that the electricity supply industry in South Africa has for a long time past been progressing at so great a rate that extreme difficulty has been met with in obtaining plant and equipment fast enough to keep up with the requirements, and there is every indication of this state of affairs continuing for some time to come. This is not only because of the rapid increase in the demand for electricity which can be foreseen now solely for mining purposes, but also because of the steady development which is taking place in other industries of all kinds.

In respect of the domestic use of electricity the larger centres have already become electrically minded to an extent which places them in advance of most places of the same size in more highly developed countries, and the work which is being done to cultivate this field of development is now making itself felt in the smaller undertakings also.

# Ripple Control at Hoylake

FOLLOWING the official inauguration ceremony performed on Thursday last week by Councillor S. V. Tomlinson, chairman of the Urban District Council, Hoylake became the second town in Great Britain to install an "Actadis" ripple control system, and the first to have a six-channel scheme, covering the control of water heating as well as street lighting and A.R.P. warnings.




**The ripple transmitter and (right) the control board at Hoylake**

While in principle of operation the scheme is almost identical with that adopted at Maidstone nearly two years ago, there are certain differences in layout and detail. The whole of the equipment, with the exception of the ripple transmitter itself, is housed in a single building, on the outside of which is the control panel arranged in two sections.

The left-hand portion incorporates relays for the protection of the high-frequency alternator (the "transmitter"), ammeters to give current readings per phase, six key-operated switches for selecting the particular signal required and a coupling board (which enables the desired selection of feeders to be made), as well as various pilot lighting and the actual starting switch.

The right-hand portion of the board comprises three telltale relays to show when the switching operation has been completed; voltage regulation relays, arranged in duplicate, with voltmeters and red and green lamps showing whether the voltage is rising or falling; and a distributor, also in duplicate, which gives the right sequence of operation and operates the appropriate contactors.

Housed behind the control panel are, besides the contactor gear (Contactor Switchgear) for the selection of feeders and for voltage regulation, the automatic starter (Allen West) for the alternator, a B.T.H. motor generator set (also with Allen West starter) for supplying DC to the field of the alternator, compensating and blocking condensers (Johnson and Philips) and the main metal-clad switchgear (Reyrolle and "Memrex") covering the whole equipment.

The transmitter itself consists of a J. H. Holmes 30-kVA 1,000-V "Castle" type alternator driven by a synchronous motor, three hand-operated gear handles giving the six different frequencies. Incidentally the correct gear must be engaged before an operation is undertaken otherwise the starting switch on the control panel will not function. The frequencies employed range between 300 and 900 cycles, the different frequencies being chosen to avoid harmonics of 50 cycles and to avoid the effects of reflection and attenuation which occur when frequencies higher than about 2,000 cycles are used. As a spacing of about 50 cycles between each channel is necessary, the system can be employed for up to twelve channels.

The output of the generator passes through the various compensating and blocking condensers and is injected into the feeders by means of emission transformers (Reyrolle) housed in the basement. As these transformers are connected at points where the full network short-circuit is available they are very substantially constructed. Moreover, as they carry the load on the system permanently, they are designed to have negligible standing losses. Between 30 and 40 seconds per feeder is the time reckoned for completing a switching operation, a large scale illuminated indicator on the power station wall showing at a glance the position of the system.

The sixty or so supply engineers and chairmen of electricity departments who attended the inauguration were entertained to lunch by Measurement, Ltd., who are responsible for the "Actadis" system. Mr. H. Purslove Barker, director, presided and, in proposing the toast to the Urban District Council, paid a tribute to the work of Mr. S. S. Foster, the Hoylake electrical engineer and manager, and his staff. Councillor F. H. Smith, chairman of the Heating and Lighting Committee, responded.

Explaining briefly the operation of the system and its applications, Mr. Barker mentioned that there were in the Hoylake scheme about 300 relays for street lighting and 500-600 for water heaters. Other uses were for space heating and other off-peak loads, the personal warning of A.R.P. workers, special tariff systems depending on signals between power station and consumers, and shop window lighting.

# EMERGENCY CABLE-JOINTING

## Demonstration at Oxford

LAST week a demonstration was given by W. T. Henley's Telegraph Works Co., Ltd., of the jointing of a 33-kV cable and the making up of sealing ends with the aid of "cold-filling compound" in conditions that might be expected as a result of an air raid. It was assumed that cable at the Oxford switching station of the Central Electricity Board had been damaged by a bomb and that the ground had been contaminated with gas.

After de-contamination of the soil (but not of the ironwork or insulators) in full A.R.P. equipment a straight joint for three single 0.5 sq. in. lead-covered paper-insulated cables was made in a wooden "coffin" by a jointer and mate. The cores were spread in triangular formation without distance pieces, being held in position by the compound which solidifies rapidly enough to support them.

The lead covering was stripped back from each tail for about 18 in. from the end, and the paper was stripped back about 1 in. on each core. The two ends of the conductor were joined by a bolted connector, the latter being surrounded by a lead stress shield, which was split for squeezing into position after securing the connector.

An impregnated paper tube surrounded the connector for about 6 in. on each side and the compound appeared to flow easily to fill the intervening space. When the three cores had been jointed, the coffin was filled with Henley's cold-filling compound, the cable entries being kept tight by means of tape and plastic compound.

**Straight-through jointing of three single-core 33-kV cables, and making-off sealing ends**

Simultaneously, two other jointers were making up three 33-kV sealing ends erected on steel work. In this case the single-core tail was taken into the sealing end with its lead stripped back and the conductor was secured to the top cap by a flexible bolted connection instead of the ordinary sweated connector. The gland was wound with tape to prevent leakage while pouring the cold-filling compound.

Cold-filling compound was originally developed for filling joint boxes in fiery mines as it does not require to be melted by heating. It consists of a black compound and a hardening agent about one third of the former being worked up into a paste for three minutes and the whole mixed together for five minutes. Within half an hour after the blending, the compound becomes too thick to pour, reaching its final consistency in a semi-plastic solid in about a week. As shrinkage is small, topping up which involves several hours' delay is obviated.

The time occupied in jointing was slightly under 3 hr. and in making up the three sealing ends 2 hr. 20 min. The cable was energised at 10 per cent. over voltage about 4½ hr. after jointing and left on for 35 min. It was then run on load for 14 hr. 10 min. until 9.15 a.m. on the following morning. At 11 a.m. a pressure test of 66 kV DC was applied for 15 min. between phases and between phases and earth, the test being completed at 11.40 a.m. The cable was then put into service.

Earlier tests at Henley's research laboratories showed that a 33-kV joint without impregnated paper tubes could be constructed in 55 min. and that the subsequent compound filling took 57 min., making 1 hr. 52 min. in all. The time taken for the joint including impregnated paper tubes was approximately 2 hr.

The average time occupied in making up three sealing ends was 31 min. each, including 8 min. for compound filling. After running the cable at 33-kV between phases for one month, breakdown tests were applied, the voltage being raised by 10 kV at half-hourly intervals until ultimately failure occurred.

The joint with the impregnated paper tubes failed after running at 90 kV to earth for 18 min., apparently at the end of the jointand that without such tubes failed between phases at the edge of the lead stress cone after running at 60 kV to earth for 20 min.

The three sealing ends failed after a few minutes at 80 kV to earth. In two there was no visible puncture and the breakdowns were in an incipient stage. In the third a fault developed from the top filling through the compound to about half-way down, where puncture of the porcelain occurred; there was another puncture approximately 4 in. further down.

## Tests for Steam Boilers

A BRITISH Standard Code (No. 845) has just been issued for commercial acceptance tests for steam boilers. Its object is to indicate the methods which should be adopted and the data which it is desirable to obtain when carrying out a simple efficiency test at minimum cost on steam-raising plant using solid fuel, to obtain a satisfactory measure of performance under reasonably steady load conditions. This code is not intended for use in the very comprehensive tests carried out on large power station boilers, for which the code included in the report of the Heat Engine Trials Committee of the Institution of Civil Engineers should be used. Copies of the Code can be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

*Organisations of the Industry—XIV*

# Electrical Association for Women

## By Caroline Haslett, C.B.E., Comp.I.E.E., Director

THE scientific discoveries of the last few generations have a real significance for the home and the housewife. In 1924 the reading of a paper to the Women's Engineering Society led a group of women to foresee the vast possibilities of electricity when they were properly realised by the housewife and the professional woman, the townswoman and the countrywoman, the bachelor girl and the mother of a large family, in fact by all women.

**The Dowager Lady Swaythling, President of the E.A.W.**

Enlightenment is necessary before appreciation is achieved and conversatism banished. Fifteen years ago women were not informed regarding electricity as a labour-saving medium, as an aid to the hostess, as an economical means of decorating and beautifying the home and as a solution to many domestic problems. Now, in 1939, women everywhere are realising that this electrical age is women's opportunity, that there is no need for domestic drudgery even for the housewife with slender means. Leisure and fitness, well-cooked food and cheerful, well-lighted homes are made available by electricity.

What might almost be termed a domestic revolution has come about largely through the crystallisation of the viewpoints of that small body of women in 1924 into the formation of the Electrical Association for Women, with the Viscountess Astor as its first President, and the writer as Director and Secretary.

As with most new ventures, vision was the only sure thing at the outset and circumstances were sometimes enough to overshadow this. The new Association shared offices by the courtesy of the Women's Engineering Society. In these early days the staff was an exceedingly small one, the Director both directing and carrying out operations. After a while, through the kindness of Colonel Crompton, the Association moved its headquarters to Kensington Court—a most appropriate setting to stimulate the growth of an organisation of women interested in the domestic applications of electricity. Then, in 1933, more commodious premises were taken in Regent Street, where an Electrical Housecraft School was established which has become a source of interest to many visitors, from overseas students of home economics to school children appreciating for the first time the range of electrical appliances for the home.

The Association has been fortunate in the distinguished men and women who have wished it well and who have translated their wishes into generous action. Its Past-Presidents have included the Lady Mount Temple, Margaret, Lady Moir, O.B.E., the Dowager Marchioness of Reading, J.P., while in its present President, the Dowager Lady Swaythling, the Association has the benefit of much sound advice in its activities in addition to grace, charm and wit at its national functions. The present campaign to link electricity and physical fitness through the media of nutrition, good cooking and economic buying, has received an impetus from the keen personal interest of the President, whose intensive knowledge is reinforced by her wide experience as a traveller. Among the well-known men who early showed faith in this young Association and have given great support must be mentioned Sir Andrew Duncan, Sir Archibald Page, the late Dr. de Ferranti, Mr. Herbert Morrison and other Ministers of Transport, the late Sir John Snell, the late Sir John Brooke, Sir Felix Pole, Lord Hirst of Witton, Mr. J. C. Dalton and Mr. E. S. Button.

The electrical education of all women was the Association's aim and it has been resolutely pursued, each year indicating fresh channels of activity, and providing new scope and new material.

The strength of the Association lies in its decentralisation. There are now eighty-five branches and five units in Great Britain, comprising in all between eight and nine thousand women. Each branch is conducted by an energetic committee, including as officers prominent women of the district. While headquarters draws up national campaigns and arranges lectures, visits, exhibitions, conferences and special courses, all plans of work are carried out by the branches with a virility which has commanded the admiration and enlisted the support of the electrical and education authorities of the cities and towns of the provinces.

It is significant that there are now a number of women members of Electricity Committees, including two women chairmen—Bailie Mrs. Roberts, convener of the Glasgow Corporation Electricity Committee, and Councillor Mrs. Gregory, chairman of the West Ham Electricity Committee, and immediate Past-Chairman of the E.A.W.

The Association is represented on numerous bodies whose aims are allied. Requests are constantly being made for lecturers for other women's organisations, which are met by headquarters and the eight area organisers. So heavy has the demand been that a panel of speakers has been formed from the members themselves and to this end a speakers' course was organised at headquarters last year attended by a dozen women who, with their natural ability and experience added to this short training, are now equipped to give lectures to other women's organisations. So great has been the enthusiasm of the branches that three have organised their own speakers' courses with excellent results.

**Miss Haslett, the Director and Secretary**

The Association works in active co-operation with some Government Departments, especially with regard to its educational work. Recently evidence was given to the Departmental Committee on Domestic Subjects in Public Elementary Schools set up by the Board of Education and the Association presented evidence before the McGowan Committee on Electricity Distribution. The writer serves on the Central Committee on Women's Training and Employment appointed by the Ministry of Labour.

The E.A.W. early realised that if the advantages of electricity were to be easily available to all women there must be a closer liaison between the electrical industry and the housewife. The efficiency of the demonstrator varied greatly, and inadequate facilities existed for her training. A scheme was therefore devised whereby a definite standard of efficiency was set up, specific qualifications were demanded, and a systematic course of instruction was drawn up. Twice yearly examinations are held on the results of which the E.A.W. certificate in electrical housecraft for demonstrators and saleswomen is awarded. After four years' responsible work application may be made for the diploma, which is the guarantee of a well-trained and experienced demonstrator. To date 638 certificates and 312 diplomas have been awarded. Inci-

dentally, the Association makes investigations to ensure that the electrical equipment in domestic science colleges is adequate and up to date.

Employment is the logical outcome of training, and the Training and Employment Committees in different parts of the country are actively engaged in finding suitable posts for competent demonstrators and in notifying supply undertakings of qualified candidates for their vacancies. Previously remuneration had been as ill-defined as a demonstrator's duties, but the creation of a recognised standard of work also necessitated the establishment of a proportionate salary scale, for which the E.A.W. was largely responsible.

The electrical industry is by no means static, and the demonstrator and saleswoman must refresh her knowledge from time to time. Accordingly, the E.A.W. organises annually in London, in conjunction with the British Electrical Development Association and the E.L.M.A. Lighting Service Bureau, a refresher course attended by women from all over the country who are desirous of keeping abreast of the latest developments.

In connection with the diploma tests, Dr. Elizabeth Sloan Chesser, a Vice-President, presented a silver cup for award to the candidate who gained the highest marks for the year. On the two occasions of presentation the cup has been gained by Plymouth and Dublin.

### Training for Teachers

It was soon indicated that a similar certificate and diploma scheme for teachers would be desirable; electricity as an integral part of modern life should be included in the normal school curriculum, and teachers must be equipped to impart this knowledge. At present 540 teachers hold the E.A.W. certificate and 82 the diploma. A corresponding refresher course is organised for teachers in the form of a summer school held in one of the large domestic science training colleges. Last year the course was held in King's College of Household and Social Science (University of London), when the attendance of teachers who had already taken the previous course was evidence of its usefulness and popularity and, in addition, necessitated the arrangement of two sections—advanced and elementary.

Teachers and demonstrators keep informed of new trends in the electrical world, and in fresh applications of electricity to the domestic sphere by means of study circles at which lectures, discussions and the valuable interchange of opinion stimulate enthusiasm and increase knowledge.

Housewives, teachers, demonstrators—there still remains a large group of women who would benefit immeasurably from instruction in the use and care of domestic electrical appliances. The paid home worker is largely responsible for the smooth running of a household, and to accord her a higher status and increased proficiency in her duties the E.A.W. inaugurated a campaign which has been vigorously taken up by almost all the branches, and active support has been received from education authorities, electricity departments and many organisations concerned with the welfare of women domestic workers.

A course is arranged consisting of approximately ten classes of simple instruction in the handling and maintenance of domestic electrical apparatus, terminating in a practical test, on the results of which a certificate and badge, if desired, are awarded. The certificate is endorsed in accordance with the duties of the candidate, *i.e.*, general maid, student maid, student. In the last three years 394 certificates have been granted, and many branches are arranging a third and fourth series of classes. The electricity departments give much practical assistance, and often the course is conducted by the demonstrator in the electricity showroom. In addition to participation by mistresses and maids, candidates are sent from Home Office and London County Council Residential Schools.

### Encouragement for Students

A counterpart of the Sloan Chesser Cup for Demonstrators is the rosebowl presented by Miss Edna Walter, M.B.E., B.Sc., chairman of the Worthing Branch, for annual competition by students from central, high, secondary and elementary schools. The memory of the kindly encouragement and generous support of the late Sir John Snell is perpetuated in one of many ways by the bursary fund, which he and Lady Snell inaugurated to enable the course and examination for the home workers' certificate to be taken by girls who could not otherwise have afforded to do so.

The schoolchild of to-day is the housewife, teacher, demonstrator or home worker of to-morrow, and therefore an early introduction to electricity and its domestic applications is necessary. The system by which there are now thirty-six schools affiliated to the Association provides lectures on electrical topics, visits to places of electrical interest, and a supply of suitable electrical literature. In addition, an annual essay competition on a set subject has indicated the appreciation of electricity's place in the modern world felt by the growing generation. Frequently, parties of boys and girls visit the Electrical Housecraft School, Regent Street, and express keen interest in the apparatus demonstrated there. The Lady Mount Temple Cup is awarded annually to the school submitting the winning entry in the essay competition, and cash prizes are presented to the successful authors.

From time to time the E.A.W. represents the woman's point of view on electrical matters at conferences in this country and abroad. The Association took part in the British Empire Exhibition at Wembley in 1925 and also in the recent Empire Exhibition in Glasgow. On both these occasions Her Majesty Queen Elizabeth gave public recognition to the E.A.W.'s work. In 1937 an invitation was accepted to contribute to the Women's Session of the International Congress on Lighting Applications organised in Paris by the Association of Illuminating Engineers. Tributes to the Electrical Association for Women which, apart from its daughter associations in Holland and Australia, is unique in the world, are paid at international conferences and especially at the World Power Conference in Vienna last year. Annual recognition of the importance of the woman's viewpoint on electrical matters is made by the Incorporated Municipal Electrical Association in the arranging of a women's day during its convention.

Of the many subjects which claim the attention of the E.A.W. the planning of the home, and particularly the kitchen, to ensure adequate lighting facilities and a sufficiency of outlets among other considerations, is a matter which is arousing increasing interest. It is hoped to secure a closer co-operation between the many bodies concerned, architects, builders, electrical contractors and decorators, and to this end a conference was organised in Rugby recently under the auspices of the British Thomson-Houston Co., Ltd., and the Hotpoint Electric Appliance Co., Ltd. Harmony of action among all the participants is necessary in building and equipping the modern home for the modern electrically minded housewife, but before this there must be complete agreement regarding the essential requirements of such a house.

In addition to planned activity the Association is asked through its Housecraft School and inquiry bureau to supply information ranging from electricity for the countrywoman to advice on electrical equipment for the town flat. Visitors from overseas are numerous, and one and all express their admiration for this organisation of women equipped to impart information on electricity as it affects women.

## Progress in Tasmania

IN its report for 1937-38 the Hydro-electric Commission of Tasmania states that the growing demand for electricity for industrial applications makes it imperative for further developments to be investigated. The installation of additional plant at Tarraleah will probably entail the construction of a high dam at Butler's Gorge, and in connection with this scheme Mr. W. E. Maclean (Commissioner) visited America, Great Britain and the Continent last year to investigate the latest developments in hydro-electric practice.

All available machinery at the Waddamana and Shannon stations was last year kept working at full load and frequently on overload, and it would not have been possible to meet the demand in the winter months had not the new Tarraleah station been brought into commission; owing to the urgent need part of the plant was placed in service under temporary controls until the station was finished.

During the year 475.4 million kWh was generated, compared with 462.9 million kWh in the previous year. Of the total Waddamana generated 376.2, Shannon 84.2, and Tarraleah 15.0 million kWh. Sales amounted to 419.6 million kWh against 408.7 million kWh in the previous year. The population of Tasmania at the 1931 Census was 219,694.

In the country districts, the increasing use of electricity on the farm and in the home has made extensions possible which only a few years ago would have been economically impracticable. An indication of the rapid expansion in the use of electricity for cooking, water heating and general domestic purposes is the increase of 46 per cent. in kWh sold, although the number of consumers only rose by 13½ per cent. At the end of June last year there were 14,063 retail consumers in country districts.

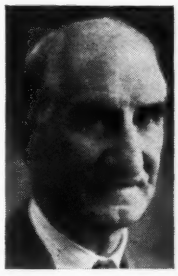
In the Hobart area the activities of the building trade were reflected in an increasing demand for all types of electrical apparatus, and at the end of June there were 1,141 all-electric homes. Electric water-heating systems connected numbered 2,191 and cookers 1,978.

# RESIDENTIAL DISTRIBUTION

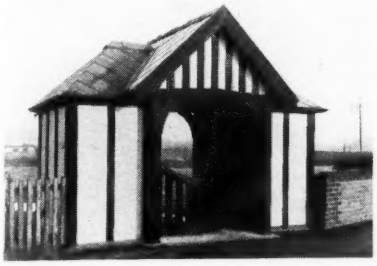
## Network Reconstruction at Thornton Cleveleys

IN an article which appeared in the ELECTRICAL REVIEW of March 27th, 1938, Mr. A. G. Cooper, chief electrical engineer, and Mr. H. Carpenter, deputy electrical engineer, Thornton-Cleveleys U.D.C., described a system of ring distribution which they had worked out with a view to minimising the number of consumers affected by a cable fault and to facilitating restoration of supply.

This system forms part of a recently completed larger scheme for reconstructing the network at Thornton-Cleveleys that has been necessitated by the growth of the domestic load since 1926, when the original lay-out was planned. During the last four completed years the kWh sold has trebled, partly due to the large number of new houses erected which have become "all-electric" and partly due to the attractive character of the all-in tariffs which have been adopted by half the consumers, 96 per cent. of the property in the area being connected to the mains. As only 3,816,000 kWh was sold to 4,225 consumers in 1937-38, when the m.d. was 1,299 kW, the undertaking clearly qualifies for the title of "small but efficient."



**Mr. A. G. Cooper, Chief Electrical Engineer and his deputy Mr. H. Carpenter**



**Lych Gate sub-station**

The new scheme included the erection of nine sub-stations, the replacing of four sub-stations by three new ones in different positions, an increase in the capacities of six existing sub-stations, and the substitution of 150,000-kVA 6.6-kV switchgear for units rated at 75,000 kVA.

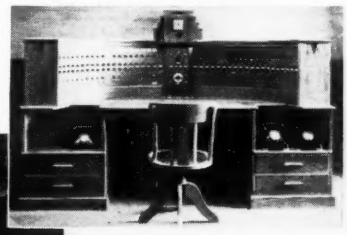
A 6.6-kV central switching station was first erected adjacent to the Electricity Department's offices and equipped with two eighteen-panel internal - isolating Whitehead switchboards, supplied by Switchgear & Cowan, Ltd., of 150,000 kVA rupturing capacity. These have been erected on either side of the switch-room with an emergency 600-A bus-coupler on the wall opposite the control room. One board controls all the "No. 1" transformers in the district sub-station and the other the "No. 2" transformers by means of 300-A circuit-breakers incorporating overload and earth leakage protection. At the centre of each board is a 600-A circuit-breaker on the incoming bulk supply.

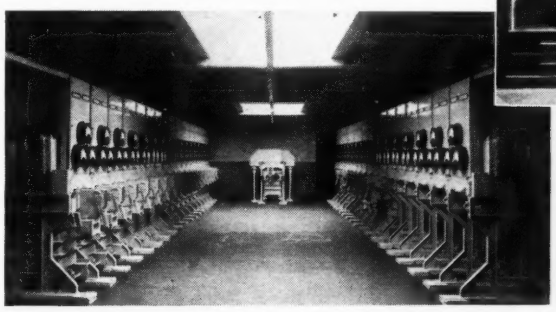
From the control room desk telephonic communication can be obtained by means of pilot cables between all sub-stations. Panels representing the various sub-stations are fitted with indicator lamps which register the position of the high-voltage circuit-breakers and also low-voltage fuse failures. This desk, which incorporates equipment by the General Electric Co., Ltd., was built up by the Electricity Department. Operating current is provided from a 50-V emergency lighting circuit.

The duplicate radial high-voltage feeders to the district sub-stations are 0.0025 sq. in. p.i., l.c., s.t.a., cables by W. T. Henley's, but 0.06 sq. in. and 0.15 sq. in. cables from the old 6.6-kV ring main were utilised where possible in addition to 65,000 yd. of new cable.

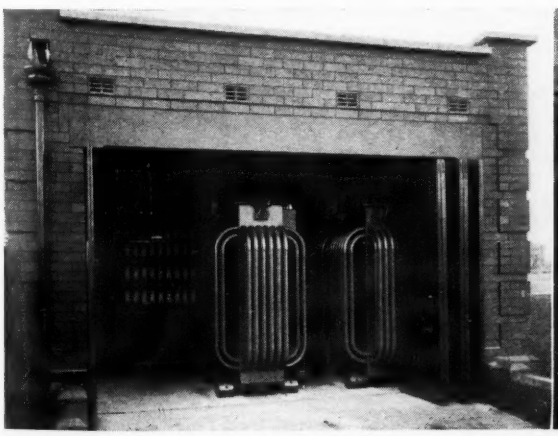
Each district sub-station (which is similar in construction to the main sub-station) is designed to serve up to 750 consumers with coincident individual demands of 1 kW within a 400-yd. radius. Each half section of the low-voltage board (Lucy & Co., Ltd.) is fed by a 500-kVA transformer, but in emergency one transformer runs at 50 per cent. overload to meet the entire demand. The circuits are controlled by English Electric clip-in cartridge fuses.

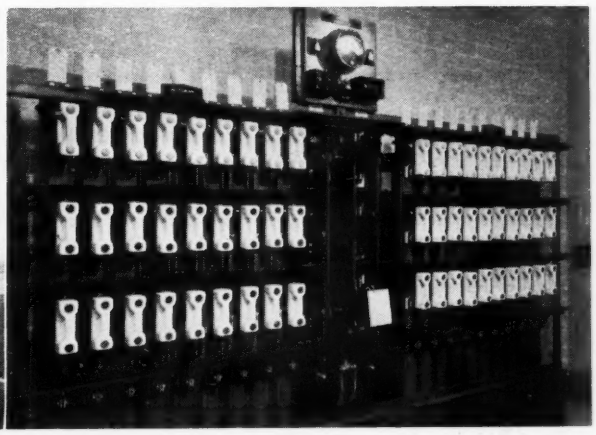
Approximately 25,000 yd. of Henley low-voltage cable have been laid, 0.06, 0.1 and 0.2 sq. in. p.i., l.c., s.t.a. There are no fused distribution pillars or boxes, but merely link distributing pillars, many of the Henley "Dwarf" overground type inserted in palisade walls. Each ring distributor will ultimately supply from 60 to 100 consumers. The mains are run between the houses, link boxes being installed with a view to expediting restoration of supply under fault conditions. The total capital cost of the work was £45,000. Reorganisation was carried out by the Council's staff to the designs and under supervision of Messrs. Cooper & Carpenter.





**The main control station and (inset) the control desk**





**Exterior and interior of the Cambridge sub-station**

# ROYAL SOCIETY EXHIBITS

## Ingenious Electrical Arrangements

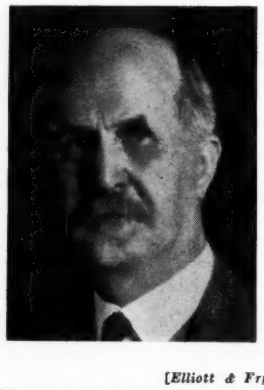
ABOUT half of the forty-five exhibits arranged for the annual conversazione of the Royal Society (president: Sir William Bragg) last week were of an electrical nature.

Among the several items shown by the British Thomson-Houston Co., Ltd., was the latest "Ignitron" mercury-arc rectifier with cylindrical steel walls, not insulated, between which cooling water flows. It is smaller in size and capable of more than double the current output of the equivalent fan-cooled glass envelope type.

The B.T.H. wide-angle electrostatic cathode-ray tube differs radically in several ways from the conventional type. Instead of employing condensers to produce separately deflections in the X- and Y-directions, it produces both deflections simultaneously by means of four L-shaped deflecting electrodes, which are assembled so as to form a prism with square cross-section. Another new feature is that the relative positions of the electron lens and deflecting systems are reversed.

In the new tube the electrostatic lens which focuses the electrons and imparts to them their final velocity is arranged at the screen end of the deflectors. Two systems of deflectors as described are arranged behind one another, connected cross-wise so as to produce opposite deflections and to make the electrons cross the axis again near the screen end of the deflectors, inside the accelerating lens. By this high deflecting sensitivity is obtained at large deflections. A further new feature is the elimination of distortion of the writing spot due to deflection by means of an intermediate image, which is formed inside the deflector system.

A polarograph made by the Cambridge Instrument Co., Ltd., for the rapid chemical analysis of liquids by the Heyronsky electrical method consists of a dropping-mercury electrode, a galvanometer and a camera in which the displacement of the film is proportional to the voltage applied to the dropping electrode. The voltage-current curve of the solution is thereby determined (on rectangular co-ordinates) in the form of a series of steps, the position of which on the voltage scale and the height of which on the current scale, indicates the nature and concentration of the ions in the solution.



*[Elliott & Fry*

**Sir William Bragg, President of the Royal Society**

A photo-electrically maintained tuning-fork has been designed to avoid the difficulties usually encountered with spring contacts or wire dipping into mercury, the usual form of valve-maintained fork not being very suitable for low frequencies. As the prongs move apart beyond their position of equilibrium, light from a lamp falls on to a photo-cell, thus producing a current which, after amplification, is used to maintain the fork. It also drives an electric clock of normal design which enables the fork to be checked very easily against a standard clock or time signals. A stroboscopic arrangement is also provided to enable the fork to be used as a master for standardising other forks or similar apparatus.

### Unusual Microscopes

The Cavendish Laboratory had on view a new form of "X-ray microscope" which converts a series of measurements on X-ray beams diffracted by a crystal into an optical image of the crystal structure, which can be viewed through an eyepiece as a projection of the structure on a plane perpendicular to the "zone" of X-ray reflections.

Holes are drilled in a brass plate, spaced according to the "cross grating" X-ray spectra given by the crystal, and of areas proportional to the amplitudes of corresponding diffracted beams. This plate is placed in front of the objective of a telescope which is focused on a point source of light, rendered approximately monochromatic by a filter. The image of the crystal structure is built up in the eyepiece by the superimposed diffraction fringes due to the holes in the plate.

The research laboratories of the General Electric Co., Ltd., exhibited a field emission electron microscope consisting of a very fine metal point at the centre of a highly evacuated bulb, on whose walls are a fluorescent screen and high potential graphite electrode.

It was shown that when a high positive potential is applied to this electrode, electrons are drawn from the point by the intense field. The electrons leave the point normally and strike the screen, giving rise to a light pattern which corresponds to a magnified image of the electron emission density at the surface of the point. The magnification is the ratio of the bulb radius to the point radius, which in these tubes is about a quarter of a million. This high magnification allows the ions of contaminating films on the point to be observed directly.

### Metallurgical Exhibits

Among metallurgical specimens, Sir Robert Hadfield included a quick-immersion thermo-electric pyrometer, as developed at the N.P.L., for the practical measurement of the temperature of liquid steel (see ELECTRICAL REVIEW, April 7th, p. 505).

Samples from the Brown-Firth research laboratories (Dr. W. H. Hatfield) showed that since the discovery of the non-magnetic 13 per cent. manganese variety, many other more or less non-magnetic steels have been discovered. Some have the advantage of being at the same time corrosion resisting. The exhibit arranged by the Director of Research, Admiralty, demonstrated the evaluation of arc and spark methods of spectro-chemical analysis of alloy steels with the aid of a Judd Lewis comparator and a photoelectric microphotometer (see ELECTRICAL REVIEW, May 5th, p. 645).

There was also apparatus for producing seconds intervals, accurate to 10 microseconds, by means of a 1,000-cycles-per-second valve maintained tuning fork controlling multivibrators, the period of the last stage being a thousand times that of the fork. On account of the extremely sharp rise of current in multivibrator circuits, the signals which are provided by the relay energised by means of the third multivibrator are equal to within 10 microseconds.

Each multivibrator consists of a single triode-pentode, injections of the high frequency into the low frequency multivibrator being effected on the suppressor grid of the pentode. This method of injection has proved superior to anode circuit or grid circuit injection. Synchronism is checked by causing the relay to charge a condenser through the coils of a cathode ray oscillograph, whose time base is synchronised by the tuning-fork.

Dr. A. Schott's electrical ergograph records "work" done by a subject in graded exercise tests in relation to certain diseases. The subject turns two handles which chain-drive at a constant speed the rotor of a motor generator, across the disconnected field of which a DC voltage is applied. A wattmeter in the rotor circuit indicates the electrical equivalent of the work done and an auxiliary resistance in the rotor circuit enables the load to be varied.

The Imperial College of Science and Technology has made (Mr. R. F. Barrow) a silica discharge tube of simple construction for use with refractory substances in investigations of the band spectra of elements in emission. Up to 4A may be applied to the electrodes, which are large cylinders of sheet nickel, and small charges of powdered material are introduced directly into the positive column without breaking vacuum.

The Cavendish Laboratory (Messrs. J. A. Ratcliffe and W. S. Elliott) showed how Barkhausen-Kurz oscillations of a wave-length of the order of one metre are produced by a triode in which the electrons oscillate with a natural period across the plane of a positive grid.

An exactly similar valve was shown in which positive ions of cæsium, emitted from a hot cathode, took the place of the electrons. The greater mass of the ions caused their time of oscillation to be greater than that of the electrons, so that the valve maintained oscillations of wave-length about 500 metres. The frequency is determined by the internal oscillation of the ions, and is independent of the external circuit.

The National Physical Laboratory had on view a compact radio transmitter for attachment to meteorological sounding balloons. The Science Museum showed a mechanical model illustrating the principle of the cyclotron together with the original Lawrence instrument (of 1931), which was the first to produce a beam of energy exceeding one million volts.

# THE PARIS FAIR

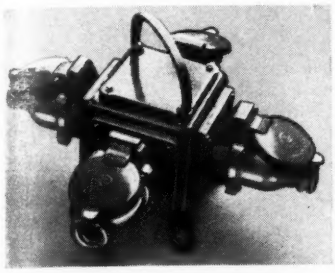
## Some New Electrical Devices

*From Our Paris Correspondent*

AS usual, the electrical section of the Paris Fair has attracted considerable attention this year. Interest has been increased to a large extent by the fact that there has been an improvement in the volume of electrical exports which has encouraged manufacturers to make a rather better show this year.

In many lines a definite improvement in both quality and design is noticeable. This is to be seen not only in the appearance of novel and practical appliances, but also in the presentation of improved types of industrial equipment.

One of the interesting novelties in the last line is a pair of new weatherproof connector boxes, brought out by Martin et Lunel. One consists of a simple cubical box, into the faces of which watertight plugs are inserted. These are interchangeable so that a box may be equipped with plugs of any desired capacity. As it is intended essentially for temporary outdoor work, the box has no provision for a permanent connection, the feed to the box, like those from it, being by simple flexible armoured cable, plugged into one of the positions. The box is provided with a handle and with legs, so that it can either be fixed to a wall or merely set down and moved about as needed .



**Four-way temporary connection box**

The second novel device shown by this concern is a combined plug and switch unit equipped with an interlocking system which permits the box enclosing the knife-blade switches, as well as the cover of the jack, to be opened only when the current is off.

Domestic appliances have reached a point to-day where it is difficult to find improvements every year. Manufacturers have, however, brought out one or two quite new and interesting designs. Several firms, notably E.R.I., have produced electric radiators which, in appearance, are much like the well-known steam radiators of central heating systems. Made of pressed sheet steel, the radiator consists of a series of metal units, held together by through bolts, and completely filled with oil. A small air cushion at the top takes up the pressure set up by the expansion of the oil when heated. Heating is by means of a thermostatically controlled heating rod, running the full length of the radiator at the bottom, which produces convection in the oil.

**Electro-plating "swabs" shown by Laboratoires Dalic**

Electric cookers show little novelty; there are some slight improvements and a very definite tendency to improving the efficiency of operation. Very small models have almost entirely disappeared, manufacturers having found that it is just as easy to sell a normal-sized range as a smaller and cheaper appliance. Both S.E.V. and Paris-Rhône are showing models of floor waxers and polishers in which the waxer has been combined with suction, taking up dust during the polishing process.

From a technical angle, industrial applications show the greatest progress. The range of electric motors, which has been constantly widening in the past few years, now covers almost every type so that there is no longer much need for imports, even of special motors. French industry in this direction has certainly shown a real effort.

Most of the electrical heating applications and the various purely industrial uses of electricity are being shown in the special industrial heating section organised as usual by "Apel" (the French E.D.A.). About 35 manufacturers have individual stands, while the Apel itself has three. These are intended rather as an advertisement of electricity than as a complete exhibition of the newest apparatus. The theme chosen this year is electricity in the small shop. This is demonstrated by three complete working installations, one for the casting and heat treatment of aluminium motor car pistons, one for electroplating and the anodic oxidation of aluminium, and one for industrial enamelling. The aluminium is melted in an Oswald Macé 36-kW three-phase furnace, is cast on the stand, and the castings are then heat treated for various results in a series of furnaces.

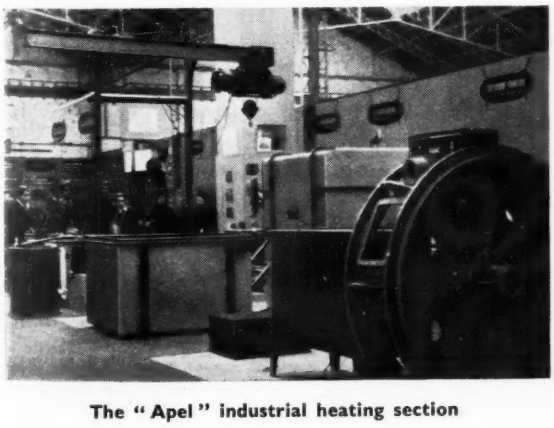
**Oil-filled electric radiator**

The electroplating installation is of Damien construction. It comprises a degreasing vat, rinsing vat, electrolytic vat, chrome plating vat and rinsing vat, all fed from a selenium rectifier, and a drying oven. The heating of the baths is electrical, and the plating installation has a total capacity of 5 kW. The drying oven is rated at 8 kW. Alongside this is the anodic oxidation installation, consisting of electrolytic degreasing, alkaline degreasing, acid rinsing, electrolytic polishing, anodic oxidation, neutralisation and sealing vats, each vat being separated from the next by a rinsing vat. This installation is also fed from a 4-kW selenium rectifier, the heating of the vats requiring an additional 15 kW.

The enamelling installation comprises only two small ovens, one a Danou of 3 kW and the other a Wild-Barfield oven of 4 kW.

Although Apel has made no attempt to show welding equipment on its stands, the manufacturers who are showing in the industrial section have made up for this. Soudare has a very interesting collection of machines, notably an end welder for welding at an angle, intended especially for the manufacture of metal door and window frames. Electromagnetique are showing their first spot welder to be built in large numbers. The capacity varies from 12 to 30 kW and the machine is particularly designed for use in relatively small installations and for the execution of delicate work. The largest models are designed to make welds on materials up to a total thickness of 8 mm.

Apart from these important installations, there are a few smaller novelties worthy of mention. One is an electroplating installation produced by Dalic, intended for small jobs or repair work. Instead of being dipped into a plating vat, the pieces to be plated are rubbed with an electrode which ends in a swab, soaked in electroplating solution. Very effective plating of small objects with chromium, nickel, silver, cadmium and other metals is claimed for this device by the manufacturers.



**The "Apel" industrial heating section**

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# CORRESPONDENCE

**Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions**

### Voltage Standardisation

THE multiplicity of supply voltages adopted in the past is, as Mr. L. Romero implies in your issue of May 12th, not wholly due to the want of co-operation between the supply authorities, since this was encouraged by the carbon-filament lamp manufacturers, who at that time could not make lamps for one standard voltage without incurring considerable waste.

The origin of the incongruous standard of 230-V ultimately selected was, I believe, partly due to the old Board of Trade Regulations making 250-V the maximum for low-pressure supply, 230 V allowing for a reasonable drop in the feeders and distributors.

However, the main reason for the voltage now chosen for the standard was, no doubt, the use of the same dynamos for lighting and traction from 460 to 500-V shunt connected for the former and 500 to 550-V compound connected for the latter. Also, some of the older undertakings previously gave a supply at from 100 to 115 V, which was doubled or more than doubled when the higher voltage lamps became available.

I recollect that at Bradford in 1896-97 the convenient, if somewhat expensive, method was adopted of installing three-wire services on all consumers' premises so as to enable a gradual change-over to be carried out by first connecting the consumers across the outers as they changed the lamps, then bunching the neutral and negative and transferring all consumers to the positive and neutral, finally energising the outers at 450 V and changing half the consumers again to negative and neutral.

I quite agree with the author that there is no great difficulty in dropping the voltage from 240 or raising it from 220 to the standard for the difference is very little more than the variations allowed by the Commissioners' Regulations. Also, provided suitable time is allowed I see no reason why, with the co-operation of the contractors and consumers, the voltage should not be gradually increased from even 210 to 230 volts.

This could be done without much expense to the supply authorities (which expense is ultimately borne by the consumers) as the resistance of the elements of domestic appliances usually increases with use, and their slightly shorter life would be offset by higher efficiency. The contractors would also benefit, for if the supply authority replaced the consumers' lamps and appliance elements at once they would lose most of their renewal business for some time. Consumers should be requested to obtain 220-V lamps during the current year and 230-V lamps thereafter.

I cannot agree with the author's concluding remark. While the three-phase, four-wire system is the most suitable for consumers in the business and manufacturing area of a town, which average only from 20 to 30 per cent. of the total, I consider, after three dozen years' experience of the single-phase system, that it has many advantages for the remaining 70 to 80 per cent. in the residential zones. Provided all consumers are supplied at the standard frequency and voltage, the extra standing charges that would be incurred in making a standard system are quite inadmissible.

Bournemouth, *May 26th.* B. SHUTTLEWORTH HORNBY

### Shop Tariffs

In an attempt to improve my small business (non-electrical) I decided to double the wattage of the lamps in my shop, but I am informed that the fixed charge is also to be increased pro rata.

In other kinds of business, the general rule is that the larger the purchase, the lower the price, but although I am now using twice the amount of electricity my bills will be doubled and I am compelled to reduce the wattage to what it was before. In this way everybody loses. I am unable to improve my business and the supply authority will have its load reduced.

In this district we are continually being advised to use more electricity, but there does not seem to be much encouragement to do so.

Residential consumers in the district are charged on a combination of floor area and rateable value—a much better system and one which, if it were applied to business premises also, would result in much more electricity being used.

*May 25th.* LAYMAN.

### "Cut Prices"

While the acceptance of a supply undertaking chief's post at below the trade union rate is invariably accompanied by an outburst of indignation among members, I have found that it is often these very same critics who purchase plant and material at "cut" prices and who resent manufacturers' "rings." Is this consistent? SALES ENGINEER.

*May 25th.*

# Co-operative High-power Testing

EXPERIENCE with the four major short-circuit testing stations in this country, since the first one was established about ten years ago, has indicated the benefits to be derived from the type-testing of switchgear, fuses, reactors, power and current transformers and other distribution equipment under conditions corresponding to those found in service.

The work undertaken there has provided technical information of considerable value, and placed British switchgear manufacturers in the position of being able to formulate a specification for the short-circuit testing of circuit-breakers, which was adopted as the basis for the standard rules issued by the International Electrotechnical Commission and used for the framing of B.S. Specification No. 116/1937.

These stations were originally built to meet the needs of the individual owners, but their scope was soon extended and much testing work has been done for industry as a whole. To-day their capacity is unrivalled by the stations of any other country. With the growth of supply systems and the consequent increase in fault currents, the demand for certified apparatus is likely to increase rapidly. The owners of the high-power testing stations considered that by acting together they could make the most efficient use of their experience and plant and could establish a recognised hall-mark for certifying apparatus for a common standard of rating, at the same time making it unnecessary for individual manufacturers to erect costly individual testing stations.

With this end in view, with the co-operation of the Department of Scientific and Industrial Research and the National Physical Laboratory, the Association of Short-Circuit Testing Authorities has been incorporated as a non-profit-making company limited by guarantee. The present members of "Asta" are: The British Short-Circuit Testing Station, Ltd., British Thomson-Houston Co., Ltd., English Electric Co., Ltd., Ferguson, Pailin, Ltd., General Electric Co., Ltd., Metropolitan-Vickers Electrical Co., Ltd., A. Reyrolle & Co., Ltd., and Switchgear Testing Co., Ltd.

Instead of individual certificates of rating for type-testing by the various companies as formerly, standard "Asta" certificates will be issued, signed by the station authority for technical accuracy and countersigned by an official of the Association under seal. For example, oil circuit-breakers will undergo short-circuit tests in accordance with B.S.S. 116/1937, and no certificate of rating will be issued without compliance with that specification.

The affairs of the Association are controlled by a Council which has appointed a management committee of engineers, including those of the testing stations. There is also a technical sub-committee, including a representative of the N.P.L., which has as one of its duties to decide in cases of doubt whether certificates of rating can be granted; another of its duties is to ensure that tests at the various stations are comparable in severity, for example, in respect of DC component, recovery voltage, power factor, rate-of-rise of re-striking voltage and its subsidiary transients and uniformity of interpretation in the recording of results.

The organisation provides facilities, in co-operation with the N.P.L., for testing any British circuit-breaker at present rated up to 11 kV and not exceeding 250 MVA, three-phase, and the manufacturers of such breakers are offered the choice of either an "Asta" or an N.P.L. certificate of rating on identical terms. Tests are carried out in private and the records of performance of apparatus are treated as strictly confidential.

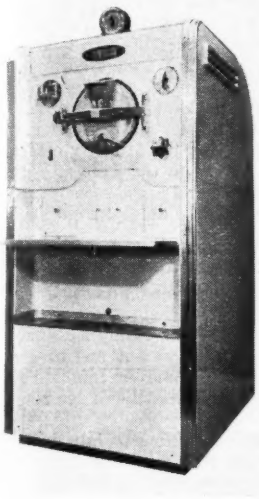
# NEW ELECTRICAL PRODUCTS

## A Review of Equipment Recently Marketed

### Making Soft Ice Cream

IN the showrooms of the GRAMOPHONE CO., LTD. (H.M.V.), 363, Oxford Street, London, W.1, we recently inspected a machine for making "soft" ice cream. The freezer is designed so that the ice cream which is served is fully aerated and never exceeds 22 deg. in temperature, and in this way the flavour is preserved.

A gallon of mixture—which must have a high butter fat content—is poured into the hopper in the front of the freezer, the beater and freezer are set in motion, and in less than five minutes two gallons of ice cream with a 100 per cent. "overrun" (aeration) can be drawn off as a continuous strip, and built up as a cone on the top of a cornet.



H.M.V. "Master Freezer"

The rapid heat dissipation is brought about by water cooling, while ten-point thermostatic control enables the temperature of 22-23 deg. F. (the only temperature at which it will issue in strip form) to be maintained despite a variation in the mix. A fairly high proportion of butter fat is, however, essential, and serves to lubricate the heaters and scraper.

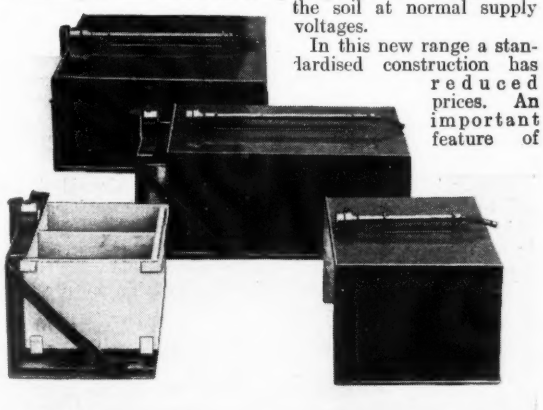
The water cooling system is directly coupled to the main and a fuse blows should overheating occur due to a failure in the water supply. The machine is switched on by opening the refrigerant valve, which in turn operates a solenoid which switches on the machine. The beater assembly is driven by a silent Morse chain belt and the exterior of the cabinet is finished in white porcelain enamel. The dimensions are 56½ in. high by 29½ in. wide by 35 in. deep.

It is worth noting that the cream can be "held" in the freezer, should there be a lull in demand, without loss of texture. A built-in hot and cold washing device reduces the time taken for sterilising.

### Soil Sterilisers

A range of electric soil sterilisers has been introduced by ALLAN MONKHOUSE, LTD., Harpenden, Herts. They operate on the electrode principle, sterilising being accomplished by the heating which occurs on the passage of electricity through the soil at normal supply voltages.

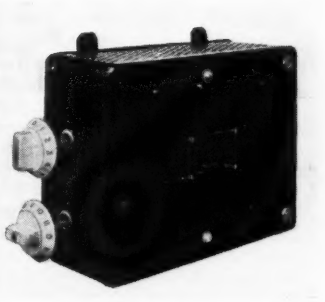
In this new range a standardised construction has reduced prices. An important feature of the new construction is that the steriliser can equally well be mounted upon a potting bench or, if desired, on a wheelbarrow. The sizes already standardised are those capable of dealing with ¼ cwt., 1 cwt. and 2 cwt. of soil.



A group of Monkhouse soil sterilisers

### Close Regulation of Cooking

The "Lokost" control system for AC cookers and hotplates, which has been developed by TRICITY COOKERS, LTD., Wellington House, 125-130, Strand, W.C.2, is designed to provide the exact temperature required for any purpose from very gentle simmering or warming to "super-speed" work. This is done by varying the applied voltage in eleven stages from 50 V upwards by means of a small tapped balancing coil, designed on a three-wire principle, which can be installed in the switch-chamber or elsewhere on any type of cooker, eleven-heat switches being substituted for those of the ordinary type.



"Lokost" cooker control

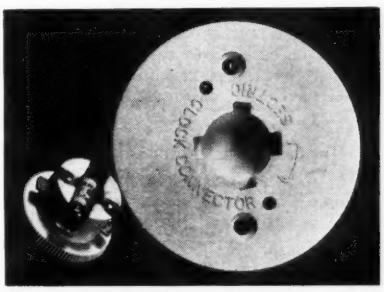
It is claimed that as super-speed conditions are used for only 10 per cent. of hotplate duty, maintenance and energy costs are appreciably reduced, while the heat losses in the balancing coil are hardly measurable.

The fine regulation possible, especially at the lower voltages, is said to ensure a constancy of results with freedom from care that gives electricity a lead over any method of food preparation. The regulator is only just over 7 in. high.

### Clock Connector for Boxes

SMITH'S ENGLISH CLOCKS, LTD., Cricklewood, London, N.W., have introduced a "Sectric" clock connector made by Wm. Sanders & Co. (Wednesbury), Ltd., suitable for fixing to B.S.S. boxes.

In all modern buildings, where the wiring is carried out in tubing, these boxes are fitted as standard for ceiling roses, switches, &c., and this new type of clock connector should therefore be of particular use to builders, architects and consulting engineers.




"Sectric" clock connector

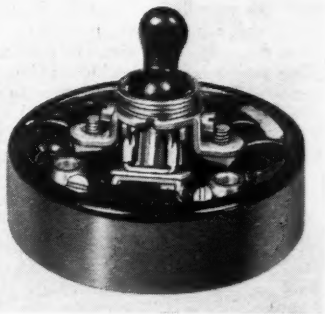
It is claimed to be the only clock connector made to fit these boxes, and is exactly the same construction as the flush and surface connectors with a fuse in the live side. As the plug can be inserted in only one position, it is not necessary to fuse the neutral circuit.

The connector is made in broken-white bakelite and can easily be painted in any required colour.

### Slow-break AC Switches

A range of slow-break AC switches with positive action but without a q.m. and b. action is the latest development of the WANDSWORTH ELECTRICAL MANUFACTURING CO., LTD., Imperial Works, Kenyon Street, Birmingham, 18.

Both standard and silent types are available, the latter having a rubber cushion. The switches are available in surface and flush patterns in 5-A ratings giving one- or two-way switching. The wiring terminals are at the top, and the flush type, which measures 1 13/16 by 1¾ in., has a specially designed earth fixing strap.



Wandsworth silent switch showing the rubber cushion

Either shockproof or metal types are available, and the design complies fully with B.S.S. 816, 1938. A test undertaken by the National Physical Laboratory showed an insulation resistance of over 100 megohms, while the voltage test of 1,500 V was successfully withstood for a minute. After carrying 5 A for 30 minutes the temperature rise was 4½ deg. C.

# CIVIL DEFENCE BILL

## How it Affects Supply Undertakings

### By a Barrister-at-Law

THE Civil Defence Bill has now passed the Committee stage in the House of Commons. The fact that the Government was able to complete this stage in the short time which the exigencies of Parliament permitted is an indication of the amount of negotiation which must have taken place between the appropriate Government Departments and the various interests affected.

It is thought that a short summary of the provisions of the Bill as they affect electricity undertakers might be of assistance to readers.

The Bill is divided into several parts, one of which is devoted exclusively to public utility undertakers. This part imposes upon electricity undertakers the following obligations :—

(1) To make a report within three months from the passing of the Bill as to the measures which they are taking or propose to take to secure that persons employed by them are trained as respects the routine to be followed in the event of an air raid, and that a suitable proportion of such persons are given additional training with regard to first aid, anti-gas precautions and fire fighting; and

(2) when called upon so to do by the Electricity Commissioners, to make a report as to—

(a) the measures which have been taken or are proposed to be taken with regard to the provision of air-raid shelters for employees; and

(b) the measures which have been taken or are proposed to be taken to secure the due functioning of the undertaking in the event of hostile attack.

If the undertakers are situated in an area declared to be vulnerable, then it will be necessary for them to make a report as to the measures they are taking or propose to take in connection with the erection of air-raid shelters notwithstanding the fact that they have not been required so to do by the Electricity Commissioners. The Electricity Commissioners will be entitled to call upon any undertakers to put into effect any matters which either have been or might have been included in the report.

### Grants Towards Expenses

Electricity undertakers will be responsible for the whole of the expenditure which will be entailed in training their staff, but in respect of so much of the approved expenditure as is of a capital nature and is incurred in connection with the provision of air-raid shelters the undertakers will be entitled to receive a grant of 5s. 6d. in the £ from the Government. A condition of obtaining this grant is that the shelters shall not exceed the standard prescribed by the regulations of the Commissioners, and that the work shall be completed by the end of September next or thereabouts.

The expense entailed in carrying out such work as may be necessary to ensure the due functioning of the undertaking will be borne by the Central Electricity Board, which will be reimbursed in the manner provided by the Bill.

Other parts of the Bill are of a general nature, and will affect electricity undertakers as well as occupiers of industrial or commercial establishments. For instance, public utility undertakers will be liable to the same obligation to obscure lights and, when called upon by the Electricity Commissioners so to do, will be required to take measures to eliminate any glare which is not capable of being screened by ordinary means. Further, the Commissioners may require any part of an electricity hereditament to be camouflaged. A grant of 50 per cent. will be made by the Treasury towards the cost involved in screening glare and camouflaging premises.

### Buildings as Air-raid Shelters

The Bill enables local authorities to designate any building which is or can be made suitable for use as a public air-raid shelter or for use in the event of hostile attack by the local authority in the discharge of any of its civil defence functions. The Bill provides that local authorities may not designate any premises of electricity undertakers without the consent of the Electricity Commissioners. It is unlikely that the Commissioners would give such consent without having due consideration and regard to the interests of the undertakers.

A further provision in the Bill relates to the erection of air-raid shelters supplied by the Government, and provides that a householder who breaks open ground for this purpose shall not be liable for any damage which he may cause to sub-surface works, provided he has taken due care. During the Committee stage the Government accepted an amendment the effect of which is that public utility undertakers shall not be liable to pay compensation or damages for or in respect of any loss of life or injury or damage to persons or property resulting from interference by the occupier with sub-surface works.

A further provision of the Bill would enable a local authority in any emergency involving the possibility of hostile attack to take possession of any vehicle and use it in the discharge of any of its civil defence functions. It is obvious that public utility undertakers could not undertake to maintain the due functioning of their undertaking if their vehicles were subject to confiscation by the local authority. It is, therefore, satisfactory that the Minister gave an assurance both on behalf of the Home Office and the Ministry of Transport that instructions would be given to the Traffic Commissioners that such vehicles as were necessary for the purposes of a public utility undertaking should be exempt from liability to requisition.

### Income Tax Allowances

The expenditure which undertakers must necessarily incur in connection with civil defence will undoubtedly raise a difficult point with regard to income tax and rating assessments. From an income tax point of view it was at one time suggested that all such expenditure, whatever might be its nature, should be regarded as a proper deduction from revenue in income tax computations.

The Government, however, was unwilling to introduce any provisions which might be inconsistent with the general law relating to income tax. It has, therefore, been decided that the question as to whether any expenditure is of a capital or revenue nature should be decided by the ordinary income tax rules.

Much of the expenditure which will be incurred in connection with what might be called the "good employer's code" is obviously of a revenue nature, and as such an allowable deduction. Where, however, expenditure is clearly of a capital nature, it will not be allowed as a deduction from revenue, but will in approved cases rank for the Government grant, which will be equal to the standard rate of income tax. The Government grant itself will not be regarded as part of the profits and receipts of the undertaking, and will therefore not be liable to be brought into tax.

### The Rating Position

With regard to rating, it was thought that the position had been covered by the Rating and Valuation (Air Raid Works) Act, 1938, the object of which was to ensure that the construction of air-raid shelters should not increase the rateable value of any hereditament. It is, however, doubtful whether this Act applies to undertakings such as electricity undertakings which are to a certain extent assessed on the basis of the profits.

It may be that the obligation to provide air-raid shelters and to ensure the due functioning of the undertaking in time of hostilities will entail the necessity of obtaining more revenue by an increase in the price of electricity. If this is the case, the receipts and profits upon which the rateable value is based will inevitably be increased, with the probable prospect of an increase in the rateable value.

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## Consulting Engineers

THE annual report of the Association of Consulting Engineers for the year ended April, 1939, records the resignation of three members during the year and the election of sixteen new ones, so that the membership is now 142. One new member joined through the Scottish branch. During the year there were 31 nominations in response to inquiries for the services of consultants, four less than in the previous year. Action was taken in respect of five cases of advertisements for consultants. The income of £652 exceeded expenditure by £217, which was rather more than in the previous year. There was also a small increase in revenue from the sale of publications, showing that the "Standard Conditions of Contract" are still widely used.

# THE FUEL RETURNS

## Analysis of Power Station Operation in 1938

A MODIFICATION in the general form of the analyses and summaries of kWh generated and fuel consumed for 1938, which has been issued by the Electricity Commissioners this week (Stationery Office, 1s. 6d. net) is to confine the main tables to the 374 stations of authorised undertakings which generate electricity and to remove the data relating to 26 traction and non-statutory undertakings to an appendix.

The particulars given for each station are the kWh generated and sent out, the fuel consumption per kWh, thermal efficiency, maximum load and station load factor (including banking hours) all on a "sent out" basis. There was a reduction of eighteen in the number of stations giving public supplies due to discontinuance of generation in twenty-one cases, to the reconditioning of Brimsdown "A" and to the inclusion of two existing stations which became part of authorised undertakings during 1938. Sections of stations in separate buildings are counted as independent stations.

During 1938 the stations operated by authorised undertakings generated 24,372 million kWh, an increase of 6.4 per cent. over 1937. Works power took 5.3 per cent. of the total kWh generated. Coal consumed amounted to 14,186,000 tons, an increase of 1.1 per cent., and fuel oil to 20,270 tons compared with 23,820 in the previous year. The stations in the appendix had an output of 1,416 million kWh and consumed 924,000 tons of coal and 64 tons of fuel oil.

A table of stations grouped in grid areas shows that 97 of the 374 were in S.E. England, 75 in S.W. England and S. Wales and 64 in N.W. England and N. Wales. Another table gives the number of stations generating various amounts in thirteen groups ranging from less than 50,000 to more than 200 million; in the former are 38 stations and in the latter 37. Other tables give the names of the stations returning the lowest fuel consumption per kWh and highest thermal efficiency in each group, the output and fuel used at stations with various types of prime mover in the different groups and in different areas.

An average of 1.45 lb. of coal per kWh sent out from steam stations (which account for 95.06 per cent. of the total) compared with 1.51 lb. in 1937, the figure for stations producing over 200 million kWh being 1.30 lb. Fuel oil consumed was 0.72 lb. per kWh (0.74 in 1937) with 0.63 lb. as the average for the best group, *i.e.*, those sending out from 2.5 to 5 million kWh, but altogether only 0.23 per cent. of the total was provided by oil engines. The contributions from water power were 4.27 per cent. and from waste heat and gas 0.43 per cent., the balance, 0.01 per cent., being derived from gas-engine stations.

Among individual performances Dunston "B" (N.E.S. Co.) heads the list for thermal efficiency with 27.85 per cent. (kWh sent out), but Battersea (London Power Co.) maintained its position for the lowest fuel consumption with 0.09 lb. per kWh. Both stations are in the over 2 million class. The one below (100 to 200 million kWh) is headed by Hackney, which ran for fewer than 8,760 hrs., with 20.48 per cent. and 1.51 lb. For outputs between 50 and 100 million Battersea Borough Council's station (also not running full time) came first with 20.02 per cent. and Hayle (Cornwall E.P. Co.) with 1.29 lb.

Other notable performances, in the order given, were to the credit of Barking "B" (County of London Co.), Fulham, Clarence Dock (Liverpool), Kearsley (Lancs E.P. Co.), Ironbridge (W. Midlands J.E.A.), Spondon (Derby and Notts Co.), Dalmarnock (Glasgow), Blackburn Meadows (Sheffield), Deptford W. (London Power Co.), Thornhill (Yorks E.P. Co.), Portishead (Bristol), Brighton, Yoker (Clyde Valley Co.), N. Wilford (Nottingham), Kirkstall (Leeds), N. Tees (N.E.S. Co.), Barton (Manchester), Hams Hall (Birmingham), Southampton, Thorpe Hamlet (Norwich), Clydes Mill (Clyde Valley Co.), Brimsdown "B" (Northmet Co.), Kingston-upon-Hull, Neepsend (Sheffield), Hardingstone Junction (Northampton Co.), Ferrybridge (Yorks E.P. Co.) and Portobello (Edinburgh). These had overall thermal efficiencies in excess of 20 per cent. There were also nine stations which came only a few decimal points short of the arbitrary 20 per cent. and which but for the change in the basis of reckoning from kWh generated to kWh sent out a couple of years ago would have been included. They are Croydon, Stourport (S.W. & S. Co.), Tir John (Swansea), Barking "A" (County of London Co.), Acton Lane (London Power Co.), Padiham (Lancs E.P. Co.), Derby, Upper Boat (S. Wales Power Co.), and Hartshead (Stalybridge, &c., Joint Board).

Three oil engine stations achieved overall thermal efficiencies higher than that of Dunston "B"; they were Newcastle-under-Lyme, 29.81 per cent,. Ilfracombe Co., 28.55, and Shorts Gardens (Central London Co.), 27.89.

Of the traction stations in the appendix, the Greenwich station of the L.P.T.B. returned an overall thermal efficiency of 20.17 per cent., Lots Road and Neasden, of the same authority, closely following with over 19 per cent., which was attained also by Pinkston, the Glasgow tramway station.

# The Finchley Undertaking

## Report of Special Committee

WHEN, at the meeting of the Finchley Borough Council last July, it was disclosed that there had been a deficit of £17,516 on the previous year's working of the electricity undertaking, a special committee under the chairmanship of Alderman A. T. Pike (then the Mayor) was appointed to investigate the affairs of the undertaking. The committee has now issued its report which surveys the position from 1936. In July of that year the McGowan Report was published, the terms of which led the Council to institute a progressive sales policy and undertake the provision of two showrooms. Considerable expenditure on replacing cables and improving the distribution system was also embarked upon.

In September, Mr. C. R. Westlake, appointed general manager and engineer the previous April, presented a report recommending large additional capital expenditure and suggesting the appointment of independent consultants to report upon the conditions referred to. At the time the Council decided against such action, but in the following year Messrs. Kennedy and Donkin were asked to submit a report, which was furnished to the Council in April, 1938. In this it was stated that the capital expenditure which the Council was then incurring on the distribution system and in other ways, with the large additional capital expenditure recommended in the general manager's report, was justified.

It would have been an advantage, the consultants thought, if the Council had spent more on distribution during the ten years before 1936, especially in those years when a surplus was earned, in order better to cope with the large capital expenditure now needed on account of the rapid growth in the development of the undertaking. The additions to the distribution system carried out in 1936 and 1937 to provide for this demand were satisfactory and were sufficient when recommended, but the rate of development, the consultants suggested, was greater than the Council anticipated, and further expenditure was essential. Their conclusions were that the policy which the Council had adopted in and since 1936 was justified; that in consequence of the increased cost of electricity supplied in bulk the price to consumers must be raised by 5 per cent.; and that a scheme for changing over part of the system to AC and for increasing the distribution system should be put in hand at a cost of £314,580.

In July last the Council raised the lighting flat rate from 3d. to 4d. as the first measure in a general upward revision of charges found to be necessary upon a full investigation of the position, apart from the increased cost of bulk supply, and in February of this year a scheme of capital expenditure amounting to £358,560 was adopted, the increase over the consultants' estimate being due to the rapid rate of development since the report was received.

With the recommendation of large capital expenditure and the deficit on the undertaking during 1937-38 the Council considered instituting some form of financial control which would give a clear indication of the trend of events for the immediate future years, but the special committee favours a continuation of the present co-operation between the Electricity and Finance Departments, revised from time to time as may become necessary, being satisfied that the borough treasurer enjoys full access to and co-operation with the general manager.

Examining the capital expenditure, the committee finds that this is justified by the phenomenal growth of the borough and consequent increase in consumers; the increased use of electricity; and the replacement of obsolete plant and the renewal and improvement of the system. On the latter point two heavy items have been the replacement of services and associated equipment. Further, the Council has reversed the policy of having the majority of disconnecting points underground. The completion of the programme will result in the

(*Continued at foot of next page.*)

# PERSONAL AND SOCIAL

**Information regarding new appointments and other matters of interest for this page are welcomed**

THE Council of the Institution of Electrical Engineers has appointed **Mr. W. K. Brasher,** B.A., M.I.E.E., to succeed Mr. P. F. Rowell as secretary of the Institution. Mr. Brasher, who will take up his duties on September 1st, was educated at Clifton College and at St. John's College, Cambridge. During the war he held a commission in the Royal Engineers (Signals) and served in France. Subsequently, after eight years in the Post Office Engineering Department of British Guiana and four years in the Department of Posts and Telegraphs, Iraq, he was appointed in April, 1933, to his present position of Chief Engineer, Posts and Telegraphs, Palestine.

**Mr. G. R. Sharpley,** managing director of Ruston & Hornsby, Ltd., has been elected chairman of the company to succeed the late Col. J. S. Ruston, whose death was reported recently. Mr. Sharpley joined the company in 1888, and has visited many parts of the world on the company's behalf. In 1895 he was appointed works manager, and in 1912 was elected to a seat on the board. Since 1921 he has held the position of managing director, which he is retaining.

**Mr. P. V. Summer** has been elected chairman, and **Mr. F. N. Shaw** vice-chairman, of Dictograph Telephones, Ltd.

**Mr. F. W. Stokes,** works foreman at Hooper's Telegraph & India Rubber Works, Millwall Docks, retired on May 19th after a period of service with the company which began in 1871 and was only temporarily interrupted by employment abroad between 1882 and 1887. Although he was over ninety-four years of age at the time of his retirement he was still actively directing the work of the factory, and there can be few similar instances of a responsible position occupied for so long a period. Mr. Stokes gave to his work a devoted interest that earned the esteem and confidence of the company, and he had the respect and friendship of all who worked with him.

**Mr. W. H. Le Marechal,** works manager with Siemens Electric Lamps & Supplies, Ltd., at Preston, is retiring shortly, and has been presented by the employees at the works with a tea service and silver tray, and Mrs. Le Marechal has received a silver kettle. Mr. P. D. Oakley, assistant works manager, will succeed Mr. Le Marechal as works manager.

**Mr. J. C. Smith,** who for the past ten years has been assistant staff engineer at the Inverness electricity works, will shortly take up a position with the Ayrshire Electricity Board at Kilmarnock. He has received a parting gift from his colleagues in the Inverness electricity works.

**Mr. F. E. J. Ockenden,** of Everett, Edgcumbe & Co., Ltd., has been nominated for the chairmanship of the Meter and Instrument Section of the Institution of Electrical Engineers.

Members of the Scottish Centre and the Dundee Sub-Centre of the Institution of Electrical Engineers held their annual excursion to Pitlochry, Perthshire, on May 27th. Among those who travelled were Capt. B. S. Cohen (London), Messrs. W. Sutcliffe, R. B. Mitchell, and A. E. McColl (Glasgow), Prof. A. R. Fulton and Mr. D. H. Bishop (Dundee), Mr. W. S. Sawtell (Galashiels), and Prof. G. W. O. Howe (Glasgow). At the sports Mr. Sawtell won the Hutcheson-Winning Golf Cup.

Redcar Town Council has appointed **Mr. R. K. Jenkins,** of Norwich, as borough electrical engineer in succession to the late Mr. J. A. O'Brien. Mr. Jenkins, who is thirty-eight, is senior assistant distribution engineer with the Corporation Electricity Department at Norwich, where he has been since 1930. He was previously a member of the staff of a power company, with whom he received his training.

**Mr. E. V. Boddis,** formerly resident engineer to the Electricity Company of Macclesfield, Ltd., who last August was appointed manager of the Madeira Electric Lighting Co. (1909), Ltd., is back in Macclesfield on a two-months' stay.

**Sir Robert McLean** has been appointed managing director of the Gramophone Co. and the Columbia Graphophone Co. Sir Robert has been on the board of Electric and Musical Industries, Ltd., since February.

The annual dinner of the Association of Old Cromptonians was held on May 19th, at the Trocadero, Piccadilly, W. A large gathering was presided over by **Mr. E. J. Fox,** chairman of the Stanton Iron Works. Colonel Crompton, who has now retired and is living in Yorkshire, was unable to be present, but a telegram was received from him wishing everyone a merry evening. Lord Dudley proposed the toast of "The Association" and Mr. Fox replied. Mr. S. Mayor proposed the toast of Mr. Frank Parkinson, who in reply said that if he were a dictator he would give engineers a very high place in society in view of the invaluable services they performed. Among the many distinguished guests present were Lieut.-Col. K. Edgcumbe, Comm. T. H. Roberts Wray and Messrs. J. C. Macfarlane and J. Willoughby Meares.

A farewell supper was given to **Mr. A. Copelin,** Ediswan lamp works stores manager, whose fiftieth anniversary of service with Ediswan coincides with his retirement. Mr. Copelin joined the company in 1889, and was first given work in the Photometer Department of which he later took charge. Mr. Copelin recalled that in those days he began his day's work at 6 a.m., rising at 4.30 to make the tramp from Edmonton to Ponders End; there were no buses or trams to take him to and from work, and for these long hours of work he earned ten shillings a week. He also mentioned his association with Mr. W. H. Berry, of theatrical fame, who also started his business life at Ponders End under the same conditions, yet found time to organise the Black Swan Minstrel Troupe.

In 1889 Prof. (now Sir Ambrose) Fleming was technical advisor to Ediswan, and not long after Captain Mullard began his career at Ponders End under Mr. Copelin; Mr. Belling of Belling & Lee was also employed with Ediswan about that time. It is interesting to recall that Mr. Copelin engaged Mr. Le Marechal, who later left to become manager of Siemens' lamp factory at Preston.

Other interesting reminiscences included work on the experimental vacuum flasks of Sir James Dewar, and the visual lamp on which Mr. Copelin did much of the ground work. In 1908 Mr. Copelin was promoted to the managership of the special lamp department. Mr. F. V. Hasemore, director and general manager of Edison Swan Electric Co., Ltd., in a short speech seconded the toast to Mr. Copelin, proposed by Mr. A. G. Everett, lamp works manager. The guests included old retired friends and an intimate circle of business associates.

## Obituary

**Mr. J. W. Ife.**—We regret to announce the death of Mr. John Wyatt Ife, the late secretary of Holophane, Ltd., which occurred in Mitcham Hospital, on May 27th, at the age of seventy-three. Mr. Ife spent the greater portion of his business life as secretary of Holophane, Ltd., from which company he retired on pension in April, 1934. He was a life member of the Illuminating Engineering Society of which he was one of the founders, and he acted as treasurer for many years before his retirement. His service to the cause of better lighting was acknowledged by the Society in making him a life member.

**Mr. T. R. Park,** who died after a short illness at his home, Daldean, Buchanan Drive, Cambuslang, on May 22nd, was a director of Johnston, Park & Co., Ltd., electrical engineers, of Glasgow.

**Lady Canning.**—We regret to record the recent death of Lady Canning, wife of Sir Ernest Canning, Deputy Lord Mayor of Birmingham and chairman and managing director of W. Canning & Co., Ltd.

**Will.—Mr. H. C. Walker,** late chairman of Waygood-Otis, Ltd., left £32,970 with net personalty £30,119.

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**Finchley Undertaking (continued)**

minimum delay in restoring the supply after interruption and a reduction in the amount of money invested in spare equipment, which the committee feels to be sound.

On the sales policy instituted by the Council, figures are given showing the transactions at the two new showrooms, and the committee is of the opinion that the opening of the showrooms was justified. As to the success of the sales policy, the committee points to the kWh sold in the past five years, as follows (millions): 13.1, 16.5, 19.2, 24.9 and 30.0 (estimated for 1938-39).

The "free cooker" scheme has been examined closely and the committee is satisfied that this has made a substantial contribution to the sales of the undertaking and, more especially, that it has induced a profitable daytime load. It considers that the introduction of the scheme was fully justified and that at the time of its inception it represented a sound commercial proposition.

With regard to the programme of capital works for the five years to 1943, amounting to £479,190, the committee considers this necessary to place the undertaking in a state of perfect organisation and equipment. In spite of the tariff increases, however (which are felt to be justified and equitable between the various classes of consumers) the following results are estimated: 1938-9, £23,639 deficit; 1939-40, £4,660 surplus; 1940-41, £3,767 deficit; 1941-42, £8,520 deficit; and 1942-43, £12,799 deficit. It is suggested that the position should be reviewed each year by the Electricity Committee to avoid such deficits as far as possible. It is pointed out that no provision is made in the capital expenditure during the immediate future for the replacement of obsolete meters as a result of recent legislation.

In conclusion, the committee records its opinion that the steps taken to improve the efficiency of the undertaking reflect great credit upon the general manager and the staff of the undertaking. It believes that ultimately the heavy capital expenditure and the planned development will prove remunerative and beneficial to ratepayers and consumers.

# COMMERCIAL AND INDUSTRIAL NEWS

**Plant Depreciation Rates. New Showrooms at Hamilton. A Restaurant Installation. Electricity at Oxted Hospital. Ironmongers' Conference. Radiolympia Competition.**

## Wear and Tear Allowances

THE Board of Inland Revenue has furnished to the Association of International Accountants a revised schedule of agreed rates of depreciation for the purpose of computing liability to income tax. This is published as a supplement to the Association's journal for May and can be obtained at the price of 7d. from the Association, Planet House, 12a, Finsbury Square, E.C.2. The schedule lists the principal industries and gives the rates of wear and tear allowance for particular types of equipment (including electrical) employed in each. It is seen that 7½ per cent. is allowed in the case of electric motors and 12½ per cent. for electric furnaces. Electrical installations on farms are also given an allowance of 7½ per cent. For the electricity supply industry the following rates are laid down:—Cables (including laying) 3 per cent.; meters 7½ per cent.; Diesel engines 10 per cent.; other generating plant and machinery 6¼ per cent.; and other plant and machinery 5 per cent. As regards domestic appliances the allowances are as follows:—Cookers and kettles 20 per cent.: refrigerators, washing machines, wash-boilers and water heaters 15 per cent.; and other kinds of apparatus 10 per cent. A depreciation rate of 15 per cent. is stipulated for trolley-buses (against 20 per cent. for motor buses).

## New Hamilton Showrooms

The new showrooms and demonstration hall erected at a cost of over £5,000 by Hamilton Corporation Electricity Department were opened on May 25th by Bailie M. Shinwell, senior magistrate, in the absence of Provost Cassells. The ceremony, presided over by Councillor T. Rankin, convener of the Electricity Committee, was attended by members of the Corporation, officials, and representatives of electrical associations. In declaring the showrooms open, Bailie Shinwell remarked that it had been the custom for such undertakings, whether public or private, to provide the services and await the customers. This policy no longer commended itself. In these modern times they had all found that if they were to sell their goods they must advertise. Councillor Rankin spoke of the progress made by the Department since the local authority took over the undertaking in 1926.

Two storeys in height, the building is of modern design and the white smooth stone front will give the best effect when floodlighted. The showroom and offices are on the ground floor. The inside walls of the showrooms are finished in walnut with sycamore inlay and macassar ebony cope.

In the demonstration hall, on the upper floor, a range of kitchen appliances is fitted up at the rear of the platform. The whole of the electrical installation was planned and carried out by the burgh electrical engineer (Mr. W. J. Cooper).

## United States Electrical Exports

According to the *Electrical World* the exports of electrical equipment during the first quarter of 1939 totalled $24,672,867, as compared with $27,825,265 for the first quarter of last year. March exports were valued at $10,006,969, a gain of 35.4 per cent. over the February total of $7,390,087, but about 7.8 per cent. under the total for March, 1938, of $10,851,281.

Increases were almost general in the electrical equipment report field during March, with shipments of motor generator sets totalling 259, valued at $104,698, as against ninety-six sets valued at $36,522 during February. Exports of DC generators increased to 123 units valued at $41,010 in March, as against sixty-three units valued at $9,848 in February. Exports of AC generators also increased, advancing to $26,298 during March, as compared with $12,753 in February.

## Another Electrical Tableau

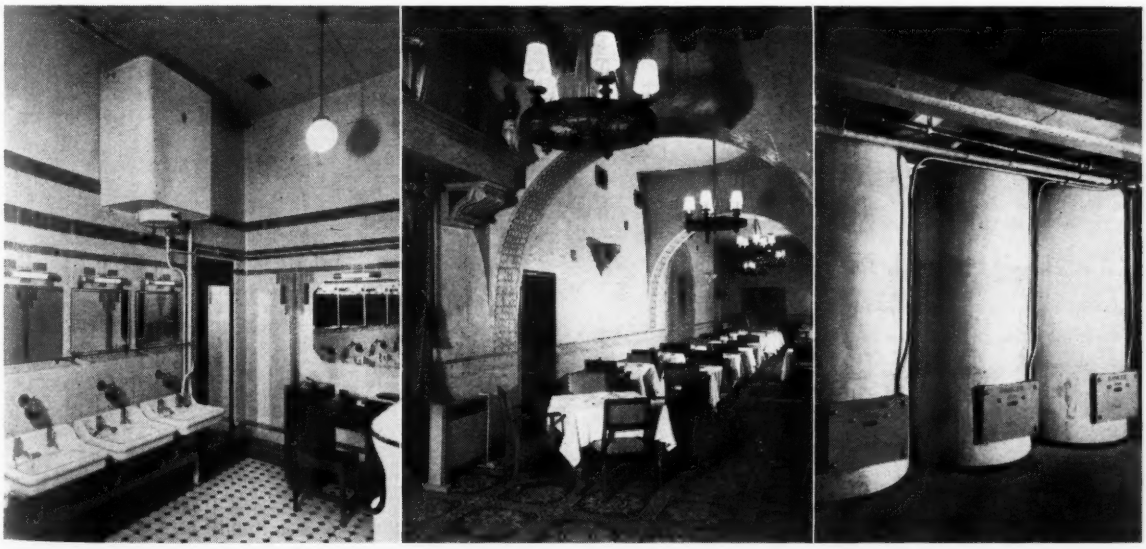
The accompanying illustration shows the entry of the East Ham Borough Council Electricity Department in connection with a gala in aid of the East Ham Memorial Hospital. As will

**East Ham Electricity Department's entry in a local carnival**

be seen the central motif is an enlarged representation of a domestic iron, and on each side of the vehicle are 1½-gallon water heaters, attention being drawn to the fact that a domestic iron can be hired for 1s. per quarter, and water heaters for 1s. 6d. per quarter, including all maintenance.

## A Modern Restaurant

The new Empire Restaurant in Rupert Street, London, W.1, has the distinction of being the first of the Aerated Bread Co.'s premises to employ electricity for its heating and hot water services. In the prinicpal rooms ten changes of air per hour of mechanically filtered air ventilation are provided in conjunction with "Unity" convectors fitted with self-contained thermostats, while the hot water service is designed on the principle recently developed by the Central London Electricity, Ltd., for installations of this description, whereby circulation losses are practically eliminated.



**The new Empire Restaurant, Rupert St., W.1., showing (left) a self-contained water heater in one of the lavatories and (right) the hot-water service cylinders**

Two 350-gall. cylinders, suitably lagged, are fitted in the basement, and each is heated by six 3-kW removable-core type Heatrae immersion heaters, controlled by thermostats to 230 deg. F. An additional safety thermostat is set to 240 deg. F. A "Sarco" mixing valve then reduces the temperature to 140 deg. F. and a single pipe is carried near to the main points to draw off. At these points thermostatically controlled booster heaters with low loadings are fitted so as to ensure immediate hot water, while local self-contained units fed from the cold supply are utilised for the various toilets.

By this means, the bulk of the hot water required is generated during off-peak hours, and the loading on the booster heaters is minimised, thereby reducing the maximum demand. In addition to the normal kitchen services the hot water supply has to deal with a 6,000-piece-per-hour automatic Hobart dish-washer, the rinse water for which requires 100 gal. per hour at 190 deg. F. For this, Heatrae, Ltd., in conjunction with the C.L.E., has designed a special heater. Hot water taken from the main cylinders at 140 deg. F. is fed through a break pressure tank into a 30-gal. heater fitted with 24 kW of immersion heaters controlled to 190 deg. F. by suitable thermostats.

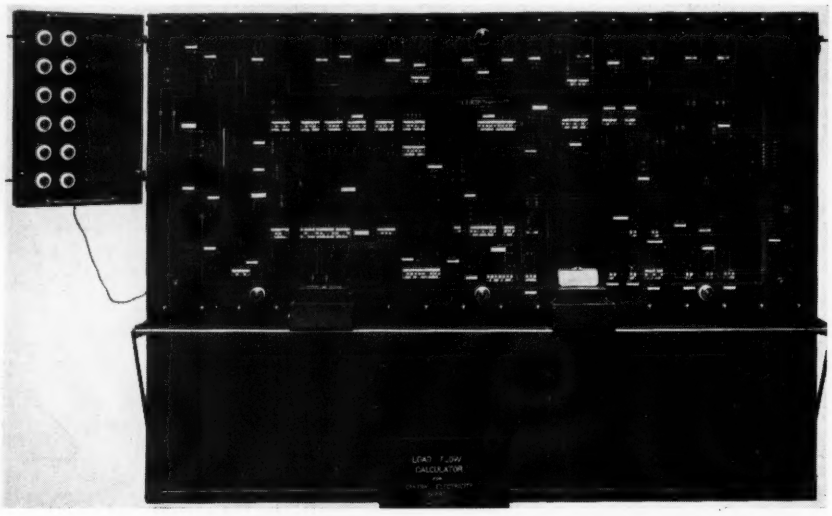
The A.B.C. places very great importance on properly safeguarding the food served in the restaurant, and electric refrigerators installed include a 285-cu.ft. chef's larder and a beer-cooling equipment (J. E. Hall); a refrigerated food display counter, an 80-lb. cube ice-maker and a 16-gal. ice-cream unit (Coldair); fruit salad preservation and soda bar equipment (Frigidaire); and food storage cabinets (B.T.H.).

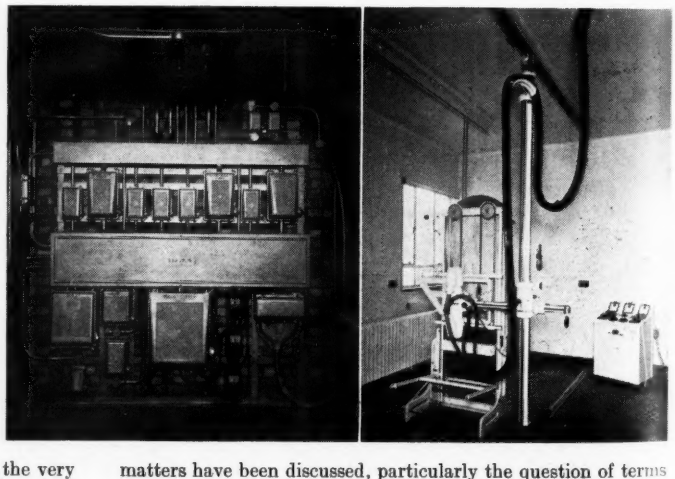
Altogether the building will have a total load of 217 kW, made up of lighting, 23 kW; power, 28 kW; heating, 73 kW; and water-heating, 93 kW. The estimated annual consumption is: lighting, 100,000 kWh; power, 62,500 kWh; heating, 80,000 kWh; and water-heating, 111,000 kWh. The design and installation of all the engineering services has been under the supervision of Mr. D. McGee, the A.B.C. works manager, and Mr. P. G. Edmonds, the electrical engineer.

## Electrical Installation at Oxted Hospital

Built by public subscription to the design of Douglass Mathews & Son, the new Oxted and Limpsfield Hospital was opened for public inspection on May 17th and received patients on May 24th from the old hospital. Among its patients was Mr. J. R. Ferguson, electrical contractor, of Oxted, who carried out the electrical installation and who was taken suddenly ill.

Supply is taken from the Sevenoaks and District Electric Supply Co., through three meters into a 100-A, three-phase main switch-fuse which feeds the bus-bar chamber. All conduit enters the channel casing shown at the top, both from the switches and sub-mains away to the building, and with this arrangement there is no crossing of conduit. The installation is in screwed conduit throughout, with Henley cables. All control gear was supplied by the Sun Electrical Co. on an angle iron frame in one piece, to Mr. Ferguson's design. There are approximately 320 lighting points and 50 power plugs of 3-kW capacity. A bell system operates from the mains, with pendant type indicators in the servants' quarters and luminous indicators in the wards. Each bed is provided with bell, bed-light and radio plug. In the operating theatre is installed the very latest type of G.E.C. shadowless lamp, with "Kathanode" emergency equipment; and the X-ray apparatus is by Siemens. The Marryat & Scott passenger lift is of 10-cwt. capacity, and electric clocks are by Smiths.





**Main switchboard at Oxted Hospital and (right) the X-ray room**

## A.R.P. Rotproof Sandbags

With the passing of the Civil Defence Bill industry will have to give attention to improved precautions for the protection of personnel. The Willesden Paper and Canvas Works, Ltd., has sent us test reports which show the advantages of the company's "Willesden" rotproofed sandbags over unproofed sandbags.

## Network Calculations

A load-flow calculator, made by the Curtis Manufacturing Co., Ltd., 26-28, Paddenswick Road, W.6, to the design of the staff of the Central Electricity Board's office for South-East and East England, is designed to give simple indications of the magnitude and direction of the load on any of the main grid circuits under predetermined conditions of loading at the various generating station and bulk supply stations. It is claimed that problems that take several days to calculate by theoretical methods, can by its means be solved in a few hours; in addition, once the calculator is set up to represent a particular condition, the effect of circuit and plant outages can be studied.

**The Curtis load-flow calculator**

Fixed resistances represent the electrical characteristics of each grid circuit, while the import or export at each grid supply point is fed into the network by plug-in resistances connected to the main bus-bars.

Any required switching conditions can be set up by means of plugs fitting into plug-block units, similar to those employed on Post Office resistance boxes. To read the load value in any circuit, its plug is replaced by a split plug in series with a milliammeter which slides on a carriage in front of the calculator.

The calculator operates at 100 V DC, which is supplied from the 230-V AC mains through a metal-rectifier. By means of a universal unit, which can be hinged to either end of the main calculator and connected to it by flexible leads, development problems involving projected extensions of circuits and stations can be investigated.

## The National Federation of Ironmongers

The annual conference of the National Federation of Ironmongers will be held at the Royal Hotel, Scarborough, from June 5th to 7th. The annual meetings of the Federation and the I.F.A. will be held on June 6th and in the evening there will be a reception by the president followed by the annual banquet. The social activities will include two golf competitions and an outing to York. Further particulars can be obtained from Mr. T. B. Jackson, secretary, Ruskin Chambers, Corporation Street, Birmingham.

The Year Book and Directory which the Federation has issued in connection with the annual conference contains the annual report, the Electrical Section of which states that the Federation has advised members not to give support to the National Association of Electrical Retailers, and so far as is known members have accepted this advice. Several new members of the Electrical Section have been enrolled. A number of meetings have been held with E.L.M.A. at which various matters have been discussed, particularly the question of terms to members of the Federation on E.L.M.A. lamps. The Federation has made certain representations and the various points at issue are under consideration by E.L.M.A. Consideration has also been given to numerous problems relating

to the distribution of electrical goods generally. The Year Book also contains the names of officers and Council members of the Federation and Association, and includes a special chapter on the Hire Purchase Act. There are geographical and alphabetical lists of members.

## E.A.W. (Lincoln and District Branch)

The inaugural meeting of the Lincoln and District Branch of the Electrical Association for Women was held on May 24th, at the Guildhall, Lincoln. Mrs. Gregory, chairman of West Ham Electricity Committee gave a short address on the aims and objects of the Association, and Mrs. Wintringham spoke on the rural aspect of electricity. Mr. F. Newey, M.I.E.E., city electrical engineer for Lincoln, and Mr. I. M. Mackay, district manager, North Lincolnshire & Howdenshire Electricity Co., Ltd., also spoke. Mrs. Wintringham was appointed president of the Branch; Mrs. Willcock (Mayoress), vice-president; Miss Savil, chairman; Miss Barham, hon. secretary; and Miss Scarborough, hon. treasurer.

## A Topical Window Display

The centre of attraction last week in the sporting world was, of course, Epsom, and

**A topical arrangement of "Coldspot" refrigerators by the Epsom electricity undertaking**

most people were trying to "spot" the winner of the Derby. The Epsom electricity undertaking, in co-operation with Berry's Electric, Ltd., seized the opportunity to stage a window display of "Coldspot" refrigerators which, as our picture shows, was effectively linked up with the local race meeting. The advice to consumers was to "invest in the 'favourite' refrigerator and you won't be let down."

## Radiolympia Competition

The Radio Manufacturers' Association is organising a contest to select the girl with the perfect radio and television personality to appear at Radiolympia. The heats will be conducted at seaside resorts, one night each week, from the week commencing July 10th to that commencing August 14th. Attention will be drawn to the contest by posters, cards,

**The Electricity Supply Board's stand at the Spring Show of the Royal Dublin Society. In the foreground is the first Jackson "Chef" cooker to be shown in Eire**

handbills, etc., and co-operative window displays. The semi-finals will be held in large centres, and the twelve selected for final judging will appear in London. Each semi-finalist will receive a radio set exceeding £10 10s. in value, and the prizes for the final will include such benefits as broadcasting engagements, television appearances and a film test. A cash prize of £5 will be presented to the concert party through which the winner enters the competition.

## Compensation Claim Conceded

The case of Harris *v.* Dorman, Long & Co., Ltd., and others, came before the Court of Appeal consisting of Lords Justices Mackinnon and Du Parcq and Mr. Justice Atkinson, on the appeal of the plaintiff, Mrs. R. M. Harris, Alperton, Middlesex, from the judgment of Lord Justice Goddard in the King's Bench Division dismissing her claim for compensation under the provisions of the Workmen's Compensation Acts in respect of the death of her husband, Mr. O. L. Harris, an electric welder, who in January, 1937, when working at Fulham power station, which was then in course of construction, slipped through a loose grating, fell 90 ft. and was fatally injured. The only present respondents were James Howden & Co. (Land), Ltd.

Mrs. Harris originally claimed under the Fatal Accidents Act damages against Dorman, Long & Co., the main steel works contractors, and two sub-contractors, James Howden & Co. (Land), Ltd. (who were the employers of the deceased man) and Allan Kennedy & Co.

At the trial Lord Justice Goddard held that under the Fatal Accidents Act there was no liability on any of the three companies mentioned and that Mrs. Harris had unfortunately not sued the one party who might have been held liable, *viz.*, the Fulham Borough Council, and that if she had succeeded in establishing liability he would have awarded her £2,500 damages.

Subsequently Mrs. Harris claimed compensation under the Workmen's Compensation Acts against James Howden & Co. (Land), Ltd., when Lord Justice Goddard ruled that that claim failed because no "reasonable cause" had been shown why it had not been brought within the statutory period and he accordingly dismissed the claim and it was against this result that the present appeal was brought.

At the conclusion of the arguments Lord Justice Mackinnon said that the only mistake (if any) was that Mrs. Harris did not sue the right party. But he (the Lord Justice) took the view that there had been other "reasonable cause" why the Workmen's Compensation Act claim was not made in time. In his opinion there ought to have been an award for compensation and the appeal should be allowed.

The other members of the Court concurred and the matter was remitted to the Willesden County Court for the apportionment of the compensation which the Appeal Court assessed at £600.

The previous proceedings were reported in the ELECTRICAL REVIEW of October 21st and 28th, 1938.

## Prices of Materials

Henry Gardner & Co., Ltd., report, May 31st: Copper bars (best selected), sheet and rod, no change. English pig lead, £16 15s., 5s. increase. Spelter, £14 2s. 6d., 8s. 9d. increase. English block tin, £226 10s., £1 5s. increase. Mercury, no change.

Frederick Smith & Co. report, May 31st; Electrolytic copper bars, £48 10s., 15s. increase. Ditto, ditto, wire rods, £53 5s., 15s. increase. Ditto, ditto, h.c. wire 7⅛d., ⅛d. increase. Silicium bronze wire, no change.

Edward Till & Co. report, May 31st: India rubber, Para fine, no change.

## Trade Announcement

James Gordon and Co., Ltd., have removed to Dalston Gardens, Stanmore, Middx.

## New Catalogues and Lists

**Thomas Jennings & Sons, Ltd.,** Permanent House, The Headrow, Leeds, 1.—A booklet describing load building by the "Hallowell" control system.

**British Insulated Cables, Ltd.,** Prescot.—A supplementary catalogue of rubber cables and wires.

**Lighting Trades, Ltd.,** 51-55, Garratt Lane, Wandsworth, London, S.W.18.—A 105-page illustrated catalogue of electrical accessories.

**Morphy-Richards, Ltd.,** St. Mary Cray, Kent.—A leaflet describing a small ironing stand.

**Zenith Electric Co., Ltd.,** Villiers Road, Willesden Green, London, N.W.2.—Details of "Ceramite" resistors.

**W. C. Davey & Co.,** 176, Tottenham Court Road, London, W.1.—A 64-page illustrated catalogue of telephones, luminous signals, relays and indicators.

**Dubilier Condenser Co., Ltd.,** Ducon Works, Victoria Road, North Acton, London, W.3.—Catalogues of fixed condensers and fixed and variable resistances.

## Private Arrangements

**H. Woodland,** radio dealer, 206, Knutsford Road, Warrington.—At a recent meeting of the creditors Mr. P. S. Booth, accountant, 2, Bixteth Street, Liverpool, submitted a statement of affairs showing liabilities of £730 and net assets of £32, leaving a deficiency of £696. It was stated that owing to pressing creditors a deed of assignment had already been executed to Mr. Booth. The debtor was anxious to pay the whole of the liabilities in full and suggested that he should pay a sum of £10 a month out of his superannuation to Mr. Booth until the claims of the creditors had been satisfied. A resolution was passed confirming the deed of assignment executed to Mr. Booth. It was also decided that the debtor's offer should be accepted.

## Bankruptcy Proceedings

**J. Bold,** 37, Aylesbury Street, Bletchley, radio engineer.—The public examination herein was held at the County Hall, Northampton, recently. The statement of affairs returned disclosed a deficiency of £363. Debtor said his failure was due to commencing the business without capital, bad debts, and falling off of trade. The Assistant Official Receiver pointed out that there were 187 book debts in respect of radio sets supplied to customers, and those book debts had been written down now by more than 50 per cent. The examination was adjourned.

**G. E. Snailum,** 160, Cromer Road, Hellesdon, Norfolk, lately trading as Ideal Electrical Co., 1 and 3, Timberhill, Norwich, electrical engineer.—The public examination herein took place at the Shirehall, Norwich, on May 23rd. Debtor had filed a statement of affairs showing liabilities of £126 with a deficiency of £111. The examination was closed.

**J. Bott,** 276A, Alfred Street Central, Nottingham, and lately carrying on business at 41, Wilford Road, Nottingham, wireless dealer.—At the first meeting of creditors herein held at the Official Receiver's Office, 22, Regent Street, Park Row, Nottingham, on May 23rd, it was reported that the gross liabilities were £72 and the deficiency £68. Debtor said his failure was due to bad trade and keen competition. The case was left in the hands of the Official Receiver, as trustee.

**A. E. Cowee,** radio and electrical engineer, 113, Mount Pleasant Road, Tottenham, N.17.—Discharged as from May 21st, 1939.

**J. A. London** (Spa Electric & Radio Co.), electrical and radio engineer, carrying on business with another at 1, Church Walk, Leamington Spa (separate application).—Discharge suspended for three months until July 28th, 1939.

**H. M. Wise,** electrical engineer and radio dealer, Corvedale Road, Craven Arms, Salop.—Trustee, Mr. F. E. Bendall, King Edward House, New Street, Birmingham. appointed May 23rd.

**F. H. Bennett,** radio dealer, 52, Oakfield Road, Ilford, Essex.—Trustee, Mr. H. C. Treby, 7, Warwick Court, Gray's Inn, London, W.C.1, released May 11th.

**H. A. Langlois,** trading as Electrical Installation Co., and/or Electrical Contracting Co., electrical contractor, 2, Atlas Place, Cardiff, and 22, Pocklington Walk, 94, Rutland Street, and Gartree Street, Leicester.—Last day for receiving proofs for dividend, June 10th. Trustee, Mr. R. Betts, 34, Park Place, Cardiff, Official Receiver.

## Company Liquidations

**Electric Truck & Battery Co., Ltd.,** 9, Palace Mews, S.W.—The first meetings of creditors and shareholders under the compulsory liquidation of this company were held on May 24th at the Board of Trade offices, Carey Street, W.C. The Official Receiver reported that the company was formed in June, 1937, with a capital of £1,000 to manufacture and deal in electric vehicles. In June, 1937, it was appointed sole agent for the sale of "Gold Seal," an electrolyte which was claimed to double the life of secondary voltaic batteries and also to increase their efficiency. The statement of affairs showed liabilities of £1,666 against assets of £1,226. The failure was attributed to the cost of testing and marketing the "Gold Seal" electrolyte and to losses in connection with agencies for the sale of "Clecolectric" vehicles and "Victor" electric vehicles. A resolution was passed in favour of the appointment of Mr. M. Rubens as liquidator of the company.

**Lowther Manufacturing Co., Ltd.,** radio manufacturers, Lowther House, St. Mark's Road, Bromley, Kent.—The statutory meeting of creditors was held on May 22nd at the company's premises. The creditors had previously met on May 12th, but no resolution was passed at that meeting as it had not been properly convened in accordance with the requirements of the Companies Act, 1929. The shareholders had, however, now passed the necessary resolution for the voluntary liquidation of the company and had nominated Mr. D. M. Chave, of 6, Westmoreland Road, Bromley, to act as liquidator. A statement of affairs at May 20th last disclosed liabilities of £1,340. The assets totalled £424, leaving a deficiency, as regarded the creditors, of £916. The present position was attributed to lack of working capital and the fact that the anticipated turnover of £4,000 was not attained. The creditors decided to confirm the voluntary liquidation of the company with Mr. Chave as liquidator, with a committee of inspection.

**Mid-West Radio Manufacturing Co., Ltd.**—Winding up voluntarily. Liquidator, Mr. J. Mundy, 22, Queen Street, London, E.C.4.

**Hartley Turner, Radio, Ltd.**—Winding up voluntarily. Liquidator, Mr. A. C. Bright, Dome Buildings, Richmond, Surrey.

**Callender's Share & Investment Trust, Ltd.**—Winding up voluntarily for reconstruction purposes. Liquidator, Mr. S. Thompson, 23, Bush Lane, London, E.C. The liquidator is authorised to consent to the registration of a new company to be called Callender's Trust, Ltd. The registration of a new company with this title is recorded on page 804.

The following companies, which are controlled by the Shropshire, Worcestershire and Staffordshire Electric Power Co., are to be wound up voluntarily, and Mr. G. O. H. Smith, 11, Waterloo Street, Birmingham, has been appointed liquidator:—Banbury and District Electric Supply Co., Ltd.; Kidderminster and District Electric Supply Co., Ltd.; Stratford-on-Avon Electricity Co., Ltd.; Ludlow Electric Light Co., Ltd.; Ledbury Electric Supply Co., Ltd.; Tewkesbury Electric Light Co., Ltd.

## Dissolutions of Partnership

**Leake Bros.,** electricians and electrical contractors, 10, Lansbury Drive, Hayes, Middlesex.—Messrs. K. G. Leake and W. E. Leake have dissolved partnership. Mr. K. G. Leake will attend to debts and carry on the business.

**Hendrey Engineering Co.,** electrical and mechanical engineers, Annett Road, Walton-on-Thames, Surrey.—Messrs. C. E. G. Ashforth and R. J. Hendrey have dissolved partnership. Mr. Ashforth will attend to debts and carry on the business.

# Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

KNOT ceiling switches.

USALITE torch.

# Brazilian Electrical Trade

THERE was a considerable improvement in the imports of United Kingdom goods into Brazil during 1937. In his report on the economic and commercial conditions in Brazil (Stationery Office, 2s. net), Mr. E. M. Harvey, Commercial Counsellor to H.M. Embassy, Rio de Janeiro, points out, however, that the rise from £3,386,000 (gold) in 1936 to £4,909,000 (gold) for 1937 was largely due to the supplies of machinery, rolling stock and other materials for the electrification of the Central Railway of Brazil.

Germany succeeded in 1937 in maintaining her position as Brazil's largest supplier, having ousted the United States in 1936. It is considered that until United Kingdom exporters grant longer credit and more attractive terms of payment, including lower prices, U.K. exports to Brazil are not likely to regain their former importance. It should, however, be taken into consideration that the exchange restrictions at present in force, owing to the delay occasioned in remitting payments for imports, tend to increase the prices of Brazilian purchases from those countries which, like the United Kingdom, do not trade by means of a "compensation" system.

| | 1937 (Weight met. tons) | Increase or Decrease |
|---|---|---|
| *Electric cables and wires—* | | |
| Total | 1,866 | + 302 |
| United Kingdom | 884 | + 32 |
| Germany | 244 | — 53 |
| U.S.A. | 346 | + 252 |
| *Apparatus and appliances for electric light—* | | |
| Total | 1,848 | + 372 |
| United Kingdom | 889 | + 383 |
| U.S.A. | 585 | — 120 |
| Germany | 247 | + 65 |

| | 1937 (Weight met. tons) | Increase or Decrease |
|---|---|---|
| *Electric dynamos and generators—* | | |
| Total | 3,489 | + 1,924 |
| United Kingdom | 167 | + 68 |
| Germany | 1,926 | + 1,107 |
| U.S.A. | 776 | + 452 |
| *Electric motors—* | | |
| Total | 613 | + 101 |
| United Kingdom | 71 | — 14 |
| U.S.A. | 165 | — 75 |
| Germany | 168 | + 59 |
| Italy | 98 | + 63 |

| | 1937 (Weight met. tons) | Increase or Decrease |
|---|---|---|
| *Transformers—* | | |
| Total | 1,218 | — 166 |
| United Kingdom | 97 | — 342 |
| Germany | 433 | — 19 |
| U.S.A. | 423 | — 149 |
| *Wireless apparatus—* | | |
| Total imports | 1,122 | + 146 |
| United Kingdom | 12 | + 6 |
| U.S.A. | 717 | + 118 |
| Holland | 249 | — 54 |
| Germany | 133 | + 69 |

Apart from the material for railway electrification mentioned above, there was a decrease in the proportion of imports from the United Kingdom of electrical apparatus, although in a number of cases the weight and value of the goods increased.

The electrification of the Central Railway of Brazil, under contract with the Metropolitan-Vickers Electrical Export Co., Ltd., has continued without interruption, and further sections of the line have been opened to traffic.

In dealing with the demand for household electric labour-saving devices, Mr. Harvey states that a large outlet already exists in Brazil for these devices, principally refrigerators, flat irons and toasters, while the continued improvement in living conditions justifies a certain amount of optimism for the future sale of such articles as electric stoves, vacuum cleaners, floor polishers, &c.

United States manufacturers have by far the largest proportion of the trade in refrigerators, and United Kingdom manufacturers desirous of entering the Brazilian market for refrigerators should bear in mind that it is almost an invariable rule to sell such expensive articles on the instalment or hire-purchase plan, and to offer a guarantee (usually five years) against breakage of moving parts. Prompt and free service should also be given during the guarantee period.

The report contains an analysis of the import trade of Brazil for the years 1935, 1936 and 1937, from which we have extracted the electrical items given in the table.

# ELECTRICITY SUPPLY

## Extensions at Battersea. Development Offsets Loss of Traction Load at Chesterfield. Poplar Council and Security of Supply. Manchester's £75,000 Profit

**Aysgarth (Yorkshire).**—RURAL SUPPLIES.—After considering plans by the North-Eastern Electric Supply Co., Ltd., for supplying North Yorkshire, the Rural District Council has decided to ask the company to extend the supply to Hawes and the surrounding villages.

**Barnoldswick.**—PROPOSED SALE OF UNDERTAKING.—On May 25th the Council agreed in principle to the sale of the electricity undertaking and negotiations are to be opened at once with the Electrical Distribution of Yorkshire, Ltd., as to terms. The resolution was passed by nine votes to four.

**Birmingham.**—HAMS HALL EXTENSION.—The fact that the Electric Supply Department of the Corporation is advertising for tenders for the construction of two ferro-concrete cooling towers and ponds for the Hams Hall "B" power station at Lea Marston, Birmingham, may be regarded as an indication that good progress is being made with the scheme. Tenders are also invited for electric cranes.

**Bishop's Stortford.**—LIGHTING IN COUNCIL HOUSES.—The Urban District Council in considering the installation of electric lighting in 37 Council houses, at an estimated cost of £300.

**Chester.**—CONCLUSION OF INQUIRY.—The inquiry into the application of the Corporation for permission to borrow £397,280 for the extension of the Queen's Ferry generating station which began at Chester in March (ELEC. REV., March 10th and 17th) and was adjourned, was resumed in London last week. Mr. Trustram Eve, K.C., for the Corporation, claimed that, with regard to the technical criticisms made, apart from boilers and the steelwork these were trivial and could be met at small cost, including the criticism of access to the site of the station. With regard to the boilers, the Commissioners would know whether those proposed were of the right type and he asked them to decide the issue. Concluding the inquiry, Sir Cyril Hurcomb said that the Commissioners appreciated the importance of the case. The findings would be communicated to the parties and not announced publicly.

**Chesterfield.**—RESULT OF YEAR'S WORKING.—Although there was a decrease of nearly 1½ million kWh in the amount of energy purchased by the Transport Department during the year ended March 31st last, owing to the substitution of oil buses for trolley-buses on the town services, Mr. D. H. Davies, the borough electrical engineer, reports that the number of kWh sold (23.54 million) was within 0.6 per cent. of the previous year's output. There was an increase of 8 per cent. in the energy sold on the flat rate for private lighting, an increase of 26 per cent. in sales under the domestic all-in rate, a 20 per cent. increase in sales for flat-rate heating and cooking, and a 60 per cent. increase in public lighting consumption, due to the substitution of tungsten-filament electric for gas lighting in the main Chatsworth Road—in the opinion of several well-known lighting experts this section of road is now one of the best lighted in the country. The average price obtained for flat-rate lighting was 2.97d. per kWh, flat-rate cooking 0.71d., domestic all-in rate, 0.73d., industrial power 0.66d., and public lighting 0.48d. During the previous year, all-round reductions were made in the charges, which resulted in a decrease in the net profit to £6,017, but the profit for the past year has again risen to £10,402 in spite of an increase of over 30 per cent. in the price paid for coal and increases in wages and cost of materials, and further reductions in charges will be made during the ensuing year. It is also interesting to note that although it is not a selected station 57 per cent. of the total requirements were generated by the undertaking's own power station, and the total operating cost of 0.76d. per kWh was only 4 per cent. higher than the average for the previous five years.

**Darlington.**—LOANS.—The Town Council is applying for permission to borrow £10,000 for meters. It is also proposed to borrow £4,168 for electric lighting in the Great North Road, Haughton Road and Neasham Road.

CHANGE-OVER.—The Town Council is applying to the Electricity Commissioners for sanction to alter the system and voltage of supply in the Cleveland Terrace area.

**Dover.**—EXPERIMENTAL LIGHTING.—Specimen street lighting has been installed in the main thoroughfare and was recently inspected by members of the Town Council. The experimental scheme includes four types of lighting, and it is stated that the system chosen will be installed throughout the whole of the main street.

**Exeter.**—AIR RAID PRECAUTIONS.—The Electricity Committee is to proceed with A.R.P. work at a cost of £1,217.

**Halifax.**—EXTENSIONS.—A sum of £15,000 is to be spent during the next few months on the extension of mains and services to outlying districts.

**Ilford.**—LOANS.—The Electricity Committee is applying for permission to borrow £20,000 for consumers' electrical apparatus for hire and £3,306 for a static sub-station near Uphall Road.

**Jarrow-on-Tyne.**—CABLES.—Approval has been given to plans by the North-Eastern Electric Supply Co., Ltd., for underground cables in Edward Street and Leam Lane.

**Johnstone (Renfrewshire).**—STREET LIGHTING.—The Town Council is to proceed with the installation of electric lighting in the main streets of the town.

**Kettering.**—ROAD LIGHTING.—A scheme for proposed further lighting of trunk roads at Kettering, submitted to the Ministry of Transport, includes London Road from Windmill Avenue to the borough boundary, and the unlighted portion of Rothwell Road to the boundary.

**Leatherhead.**—PLANT FOR SALE.—The London & Home Counties J.E.A. recommends the disposal of the 1,000-kW and 500-kW generating sets at Leatherhead, as the supply is now taken in bulk.

**Llandudno.**—AUGMENTING THE SUPPLY.—Owing to the big demand during holiday periods the electrical engineer has been asked to formulate a scheme for augmenting the supply in certain areas at such times.

**London.**—BATTERSEA.—The Central Electricity Board has requested the Council to submit an estimate for the extension of the generating station by the provision of a 30,000-kW turbo-alternator, together with the necessary boilers, ancillary plant and switchgear, the total cost of which will amount to approximately £415,000. The Board has also asked the Council to proceed immediately with the preparation of specifications and general planning of the extension.

POPLAR.—Methods of ensuring the security of the supply have recently been under consideration by the Electricity Committee. Application was made to the Central Electricity Board for a 20,000-kW extension to the Watts Grove generating station on the ground that if anything happened to the grid supplies and the largest turbine at the station was out of commission, Poplar could not maintain its supplies. In reply, the Board stated that the real question to be considered was the relative security between plant installed at the station as against a reasonable quantity of plant plus grid connections from two separate circuits. With the grid connections it appeared that the security was very much greater than could be obtained from individual stations, for there were at least two alternative supplies, and in the case of wartime damage to the Board's equipment, provision for replacement would be made from the national pool. In these circumstances the Board could not consider an extension to the power station. At the same time it was pointed out that this should not be taken as an indication that extensions at Poplar would not be considered in any circumstances. It might be that, in the future, other reasons would arise which would warrant the installation of additional plant. In reply to a further letter from the borough electrical engineer the Board stated that under the 1926 Act the Board must necessarily accept full responsibility for the supplies to Poplar at all times, including a time of national emergency. The Committee is to refer the correspondence to the Electricity Commissioners for their observations.

INCREASED VOLTAGE.—The City of London Electric Lighting Co., Ltd., proposes to increase the AC voltage from 210 to 230.

BULK SUPPLIES.—A statement of bulk supplies furnished by the London & Home Counties Joint Electricity Authority during the first quarter of the year shows an increase from 160.8 million to 185.0 million in the net bus-bar kWh, an improvement of 15.1 per cent.

**Manchester.**—A SATISFACTORY YEAR.—Electricity generated at the power station in the year ended March 31st last attained the record total of 1,010 million kWh, approximately one-third of which was exported to the C.E.B. Bulk supplies to neighbouring authorities totalled 542 million kWh. There was a surplus on revenue account of £75,245, compared with £79,576 for the previous year.

**Morecambe.**—ILLUMINATIONS DECISION.—Last week the Town Council decided to proceed with the scheme of illuminations for which £3,000 is being allocated from the rates. The Council asked counsel's opinion and received a reply indicating that the spending of money from the rates on illuminations was probably illegal. Ratepayers who threatened to take action are not proposing to force the issue this year owing to the preparations already made.

INSTALLATION CONTRACTS.—The Electricity Committee has refused a request from the secretary of the local branch of the Electrical Contractors' Association, that the Committee should receive a deputation on the desirability of Corporation electrical contracts being restricted to persons who are members

of the Association, or who are on the National Register of Electrical Installation Contractors.

**Newark (Notts).**—EXTENSION.—A new main is to be laid from Barnby Road to the Beacon Hill sub-station.

**Preston.**—REDUCING LOAD IN EMERGENCY.—Following a report by the electrical engineer on a scheme prepared by the C.E.B. and approved by the North-West England Consultative Committee for reducing the load in an emergency the Electricity Committee recommends that this scheme should be adopted locally, subject to other authorised undertakings in the area giving similar assurances to the Board.

**Slough.**—NEW SUB-STATIONS.—The Slough and Datchet Electric Supply Co., Ltd., is to erect sub-stations on a site off Sheffield Road, Baylis Court estate, and in Blenheim Road.

**Stoke-on-Trent.**—DISTRIBUTION PROJECTS.—Among works which the Electricity Committee proposes to carry out are the provision of a supply to further houses on the Bradwell Hall Farm estate at a cost of £4,750, the erection of additional sub-stations at Abbey Hulton and Sneyd Green, and the installation of a voltage regulator costing £250 to maintain the voltage at the electric kilns of Copeland & Sons, Ltd. To enable an alternative supply to be given the Electricity Committee is to complete the extra-high-voltage ring main between Goldenhill and Packmoor at a cost of £1,225. A supply is to be given to houses on the Chell Heath housing site (£8,700), and an alternative and additional supply is to be given to Haywood Hospital, Burslem (£1,350). An additional supply is also to be given to the works of the Metallic Tile Co. (Rowley Bros.), Ltd., Wolstanton, at a cost of £900. An increase is to be made in the rupturing capacity of the switchgear in the Burslem sub-station at a cost of £1,150, and in the Burslem Mills sub-station at a cost of £550.

**Sunderland.**—HOSPITAL INSTALLATION.—The Town Council is to carry out alterations to the electrical installation at the municipal hospital at a cost of £2,739.

**Tenterden (Kent).**—NO EXTENSION TO KENARDINGTON.—At a recent meeting of the Rural District Council correspondence was read between the Minister of Transport and Mr. W. P. Spens, M.P., concerning the extension of electricity to Kenardington. The Minister stated that the matter had again been investigated by the Electricity Commissioners, who were still of opinion that the revenue would not be sufficient to justify the capital outlay.

**Tynemouth.**—BULK SUPPLY.—Details of a scheme for the extension of the bulk supply of electricity to the borough were recently discussed with representatives of the North Eastern Electric Supply Co., Ltd., and terms were agreed.

A.R.P.—Nearly £1,000 is to be spent on the protection of the electricity undertaking against air raids in the event of war.

SUB-STATION CONSTRUCTION.—The Electricity Committee is to erect a sub-station at Norham Road, Percy Main, at a cost of £770.

**West Lothian.**—ELECTRICITY FOR SCHOOLS.—The Education Committee has agreed that during the ensuing financial year electric lighting shall be installed in Blackridge, Stoneyburn, Longridge, and Winchburgh R.C. schools. It has also been agreed that the remaining schools in the area should be provided with electric lighting as and when financial circumstances permit and the requisite cable facilities are available.

**Weymouth.**—MAINS EXTENSIONS.—The Town Council is to apply for sanction to a loan of £1,405 for the extension of the mains on the Radipole housing estate.

## Overseas

**Algeria.**—NATIONAL POWER DEVELOPMENT PLAN.—The Government authorities have drawn up a scheme for the extension of the electric power supply facilities. The Governor-General has been authorised to spend sixteen million francs on the extension of interconnecting transmission lines and the establishment of a new hydro-electric power station near the Oued-Fodda dam. It is planned to provide for the expenditure on the scheme by a special surtax on all sales of electric power to the public.

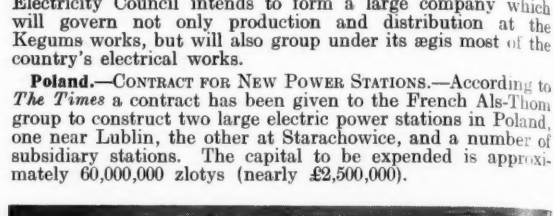
**Eire.**—CHURCH LIGHTING.—The General Synod of the Church of Ireland has given a grant of £100 for the installation of an electric lighting plant in the Urney Parish Church, Cavan.

**France.**—ELECTRIFICATION SUBSIDIES DISCONTINUED.—Electrical circles in France are disturbed by the cessation of all subsidies for rural electrification work. The reason for the Government's action is that it wishes to concentrate all its resources for the present on national defence. It is pointed out that the withdrawal of subsidies does not necessarily mean that work on rural electrification schemes will come to a standstill, but development is certain to proceed much more slowly than previously.

**India.**—EXTENSION IN MADRAS.—The Government of Madras has inaugurated its scheme for the supply of power to the Andhra districts. Three power stations have been simultaneously opened, at Vizagapatam, Coconada and Bezwada. Small thermal units are being employed until such time as the demand increases.

**Latvia.**—NEW POWER STATION.—Construction of the new Kegums hydro-electric station in Latvia is nearing completion and the question of distributing the electricity produced now arises, learns *Reuter's Trade Service* from Riga. The National Electricity Council intends to form a large company which will govern not only production and distribution at the Kegums works, but will also group under its ægis most of the country's electrical works.

**Poland.**—CONTRACT FOR NEW POWER STATIONS.—According to *The Times* a contract has been given to the French Als-Thom group to construct two large electric power stations in Poland, one near Lublin, the other at Starachowice, and a number of subsidiary stations. The capital to be expended is approximately 60,000,000 zlotys (nearly £2,500,000).



**Combined electric and coal fire kitcheners of the type illustrated have been installed in a block of workmen's flats recently opened in Berlin**

**Portugal.**—PROGRESS IN LISBON.—The report of the Compagnies Réunies Gaz et Electricité of Lisbon for 1938 shows that the output of electric power amounted during the year to 111,976,000 kWh, representing an increase of 15,853,000 kWh (16 per cent.) over the previous year. The number of consumers connected increased during the year from 116,280 to 121,993. In order to meet the expanding demand for supply, three new boilers are in course of installation at the Junqueira power station. They are each capable of producing about 50 tons of steam per hour at a working pressure of 568 lb. per sq. in. and a temperature of 460 deg. C.

**United States.**—SALE OF POWER SYSTEMS TO T.V.A.—Representatives of thirty municipalities and rural organisations have joined with Dr. Harcourt A. Morgan, chairman of the T.V.A., and Mr. W. L. Wilkie, president of the Commonwealth & Southern Cpn., in signing a contract for the purchase of the Tennessee Electric Power Co. for $78,600,000, the actual transfer being contingent upon legislation making available the necessary finance for the acquisition. According to the *Electrical World*, negotiations for the transfer of certain systems in Alabama and Mississippi are expected to begin shortly, while the contract for the sale of the Memphis Power & Light Co.'s system to the City of Memphis and the T.V.A. has already been signed.

## Stalybridge and Hyde Bill

THE Select Committee of the House of Commons on Unopposed Bills considered on May 25th the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Bill. Mr. W. W. Boulton presided.

Mr. Lee, Parliamentary agent, said that the main purpose of the Bill was to authorise the Board to acquire by agreement from the Urban Electric Supply Co. the undertaking authorised by the Glossop Corporation Electric Lighting Order, 1899. The terms on which the transfer would be made had been settled between the parties and would shortly be embodied in an agreement. It was also proposed to extend the Board's area of supply by taking in the rural district east of Glossop and power was taken to acquire by agreement other adjacent undertakings.

After formal evidence the Committee found the preamble proved and the Bill was ordered to be reported for third reading.

## Diesel Users' Association

THE annual summer meeting of the Diesel Engine Users' Association is to be held on June 15th. It takes the form of a visit to King's Lynn and the St. Germans pumping station. The general meeting will be held at the Globe Hotel, King's Lynn when Mr. G. F. Windeler will deliver his presidential address. After luncheon at the hotel the party will proceed to the St. Germans pumping station and later return to King's Lynn for tea. They will arrive back in London at 8.20 p.m.

# TRACTION

**France.**—LONGEST ELECTRIFIED LINE.—The longest electrified railway line in France, from Paris to Hendaye, on the Spanish frontier—about 512 miles—was formally inaugurated last week. M. de Monzie, Minister for Public Works, and railway leaders left the Austerlitz Station at 7.25 a.m., and arrived at Bordeaux at 12.40 p.m., thus setting up a new record for a train weighing 500 tons—covering the distance at an average speed of 68 MPH. Electric locomotives with four 1,000-HP motors have been built for this route, and the whole service will be speeded up.—*Reuter.*

**Germany.**—MAIN-LINE CONVERSION.—The first 100 miles of the Nürnberg-Halle main line of the German State Railways, from Nürnberg to Saalfeld, has just been electrified on the 15-kV, single-phase system, and electrically hauled trains have been running since May 15th. It is expected that a portion of the remaining 95 miles from Saalfeld to Halle will be converted in October and the remainder early next year.

**Italy.**—NEW ELECTRIC RAILWAY.—A newly built 35-mile railway has just been opened from Biella to Novara, in the centre of the Piedmont wool area. It is operated on the 3-kV DC system.

**London.**—METROPOLITAN LINE IMPROVEMENTS.—Work is well advanced in connection with the running of Bakerloo trains on the Metropolitan Line to Stanmore. Kilburn station has been reconstructed and the new interchange station at Finchley Road has been practically completed, while trial Bakerloo rolling stock has already been run over the lines. Work is now proceeding on the doubling of the track between Harrow and Rickmansworth and the reconstruction of Harrow station.

FARE REVISION.—Following the recent public inquiry by the Railway Rates Tribunal, lasting sixteen days, a revision of fares in the London area will take effect from June 11th. The net effect will be an increase of £1,179,000 in the pooled receipts of the London Passenger Transport Board and the main line railway companies.

**Reading.**—TROLLEY-BUSES REPLACE TRAMS.—On Sunday May 21st Reading's tram services were taken over by a fleet of 25 A.E.C.-English Electric trolley-buses, ordered in 1938 after a number of vehicles of different makes had been tested on an experimental route between Caversham and Whitley. Through throngs of people and between convoys of cycles and motor cars the last tram was driven from the western terminus of the main route to the depot at Mill Lane shortly before midnight on Saturday, May 20th. At the controls in turn were the Mayor of Reading, Councillor William McIlroy, and the chairman of the Transport Committee, Councillor Bennet Palmer.

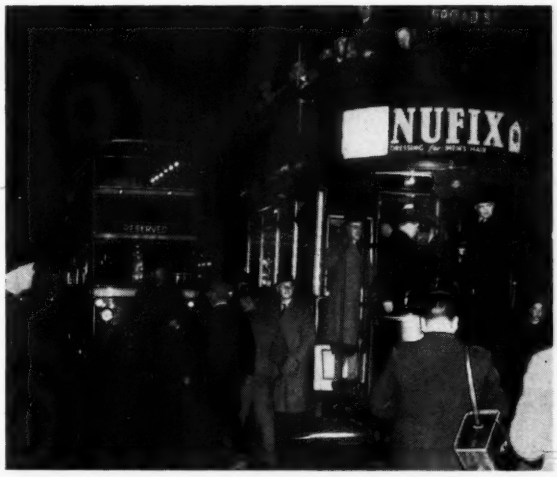
At a midnight reception the Mayor said that if there was some feeling that Reading had been rather late in adopting trolley-buses, the fact remained that the Transport Committee had profited by its own experiments and the experience of others. A special welcome was given to Mr. G. F. Craven, M.I.E.E., general manager of the Halifax undertaking, who was present that night, and who had described the Reading trolley-buses as being a first-rate fleet embodying many valuable improvements. Mr. Bennet Palmer said that there would not be many regrets at the passing of the trams because in Reading they had been one of the chief causes of traffic congestion. Nevertheless, in 36 years they had earned about £2,000,000, of which some £39,000 had been contributed to the rates. Mr. J. M. Calder, A.M.I.E.E., transport manager, added that no efforts had been spared in making investigations into the different types of transport and they had come to the conclusion that the electrical system of passenger transport was the best for Reading.

The new A.E.C.-English Electric vehicles, of the four wheel double deck type, were the first in this country to comply with the revised Ministry of Transport Regulations relating to ground clearance. Their production represented one of the most important steps undertaken in trolley-bus development within recent years. The vehicles were described in the ELECTRICAL REVIEW of February 17th last. The 25 trolley-buses replace 24 trams on a route 6 miles in length, extending from Tilehurst to Wokingham Road. The route includes that formerly served by the trams, and at the Tilehurst end replaces an extended bus route and takes in a new extension.

**South Shields.**—KEARNEY TUBE INQUIRY.—The Ministry of Transport is to hold an inquiry at South Shields on June 6th, to hear objections to the construction of the proposed Kearney electric tube railway under the Tyne between North and South Shields.

**Southern Railway.**—NEW ELECTRIC LINE EXTENDED.—According to schedules almost exactly a year after the original section was opened the new electric railway from Motspur Park to Tolworth was extended last Sunday to Chessington South, with an intermediate station at Chessington North. The two new stations are of the same modern design as those at Malden Manor and Tolworth. For the present this completes the scheme, but land has been acquired for the continuation of the line to Leatherhead.

**Sweden.**—ELECTRIC LOCOMOTIVES.—Two 3,500 HP, single-phase electric locomotives of a new design have been ordered by the Swedish State Railways from the Asea concern. They are intended to accelerate the principal express trains between Stockholm and Göteborg and from Stockholm to Malmö. They are to have individual axle drive in place of the usual Swedish rod drive, and will have a top speed of 85 MPH.




**The last Reading tram followed by one of the new trolley-buses**

# COMMUNICATIONS

**Argentina.**—AUTOMATIC TELEPHONY.—Further conversion from manual to automatic telephone operation was completed recently in Buenos Aires, and the *Review of the River Plate* reports that 94 per cent. of the telephone apparatus in the capital is now automatic.

**Canada.**—RADIO STATISTICS.—According to a preliminary report there were 1,208,400 radio receiving sets in use throughout Canada at the end of March last as compared with 1,104,200 at the corresponding date a year ago. Actually 251,259 new receiving sets of Canadian manufacture were sold during last year, this being, however, a slight reduction on 1937 (265,855). The 1938 total was made up of 162,687 all-mains sets, 66,896 battery receivers and 21,676 sets for motor cars.

**Germany.**—NEW RADIO STATION.—*The Times* states that a new 150-kW long-wave broadcasting station has recently been brought into service at Herzberg, Saxony, and takes the place of the Zeesen station. Next year the power is to be increased to 200 kW.

**Guatemala.**—TELEPHONY.—The L. M. Ericsson concern has recently signed a contract with the Government of Guatemala for the delivery of an automatic telephone station for 5,000 lines for the capital, Guatemala City, reports *Reuters Trade Service* from Stockholm. A contract has also been signed for a complete telephone installation at the National Palace. The total cost is about Kr. 1,700,000.

**Scandinavia.**—BROADCASTING PLANS.—Substantial increases in power are scheduled for Scandinavian broadcasting stations. The total estimated aerial output of long- and medium-wave transmitters in a year's time will be in the region of 1,670 kW, compared with 995 kW at present. In Norway four new stations are to be added to the present network of 14 transmitters, which will raise the total aerial output from 353 to 365 kW. In Finland the power of the Turku station is to be increased from 0.5 to 100 kW, Helsinki I from 10 to 120 kW and Helsinki II from 1 to 10 kW and the total power will be raised to 495 kW. There will be two new Swedish stations and the power of existing stations will be increased as follows: Motala, from 150 to 200 kW; Sundsvall, from 10 to 20 kW; Göteborg, from 10 to 120 kW; Falun, from 2 to 100 kW; Horby, from 60 to 100 kW; and Kalmar and Halmstad, each from 0.2 to 10 kW. The total radiated power of the network will thus be raised to 734 kW. The two new stations will be erected at Alvesta and Gotland.

## Non-destructive Testing

THE Joint Committee on Materials and their Testing announces the publication of the proceedings at the second general discussion on non-destructive testing held under its auspices in London in November, 1938. The seven papers then presented, with the report of the discussion and communications, are now available as reprints from the I.E.E. *Journal*. The volume constitutes a valuable collection of international views on current practice and opinion in this important branch of testing. Copies (about 80 pp.) are available in paper covers at the price of 3s. 6d., post free, from the secretary, Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2.

# FINANCIAL SECTION

**New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares**

## New Companies Registered

**Callender's Trust, Ltd.**—Public company. Registered May 25th. Nominal capital, £525,000. Objects: To acquire the undertaking of Callender's Share and Investment Trust, Ltd. (incorporated in 1912) and to acquire and hold shares, stocks, debentures, debenture stocks, bonds, obligations and securities, &c. First directors: Sir James Fortescue Flannery, Bt., Wethersfield Manor, Wethersfield, Essex, Sir John Malcolm Fraser, Bt., G.B.E., Pixholme Court, Dorking, and Maj. Gen. the Rt. Hon. Sir Frederick Hugh Sykes, 50, Egerton Gardens, S.W.3 (directors of Callender's Cable and Construction Co., Ltd.). The amount borrowed by the directors (otherwise than by the issue of share capital) is restricted to an amount not exceeding the paid-up share capital. Secretary: H. Foulds. Registered office: Hamilton House, Victoria Embankment, E.C.

**Safelocks, Ltd.**—Private company. Registered May 25th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in locks, and locking devices for all purposes (whether electrical or otherwise), burglar protection devices, fastenings, latches, bolts, &c. Directors: J. J. Benabo, 3, Tillingham Way, Woodside Park, West Finchley, N.12, and A. D. Edson, 45, Pownall Road, E.8. Registered office: 46a, Finsbury Square, E.C.2.

**Pullman Electric Co., Ltd.**—Private company. Registered May 22nd. Capital, £100. Objects: To carry on the business of importers, exporters, maintainers and repairers of, agents for and dealers in radio receiving and transmitting sets, motor-car radios, radio-gramophones and electrical instruments and components; hire-purchase, easy-payment and deferred payment financiers, &c. Subscribers: Miss E. F. Sanderson, 11, Gower Road, Denby Lane, Heaton Norris, Stockport, and P. Millard, 14, Aber Road, Cheadle Ches. Secretary: Evelyn F. Sanderson. Solicitor: Jacob Amelan 78a, Tib Street, Manchester.

**Electro-Chemical Engineering Co., Ltd.**—Private company. Registered May 22nd. Capital, £9,000. Objects: To carry on the business of contractors, builders, civil, electrical, constructional, metallurgical, electro-metallurgical, mechanical, chemical, electro-chemical, mining and general engineers, electro-platers, miners, producers, refiners, smelters, reducers, storers, suppliers and distributors of ores, metals, minerals, chemicals and chemical products, petroleum and substances of every kind, &c. Subscribers: D. F. Campbell, 17, Victoria Street, S.W.1 (director of Electric Furnace Co., Ltd.), and R. F. Norland, 59a, London Wall, E.C.2. Registered office: 17, Victoria Street, S.W.1.

**Menomat, Ltd.** — Private company. Registered May 24th. Capital, £6,000. Objects: To carry on the business relating to the electrical deposition of metals on non-conducting materials, &c. Subscribers: F. H. Harman, 39, Cantley Gardens, Ilford, and L. C. J. Paterson, 6, Haycroft Road, Brixton Hill, S.W.2. Solicitor: Albert M. Oppenheimer, 31, Queen Victoria Street, E.C.4.

**Radioactive Products, Ltd.** — Private company. Registered May 24th. Capital, £100. Objects: To carry on the business of manufacturers and importers of and dealers in radioactive minerals and compounds, catalyst materials, electrical apparatus, liquefied gases, rare gases and earths, &c. Subscribers: A. E. Plank, 78, Alexandra Drive, Surbiton Hill, Surrey, and H. H. Parnell, 384, Lordship Lane, East Dulwich, S.E.22. Solicitors: Johnson Jecks & Colclough, 24, Austin Friars, E.C.2.

**Lund Bros. & Co. (Streatham), Ltd.**—Private company. Registered May 19th. Capital, £500. Objects: To carry on the business of electrical engineers and contractors, suppliers of electricity, manufacturers, exporters or importers of, dealers in and agents for neon tubes in connection with advertising, manufacturers of and dealers in wireless transmitting and receiving sets, gramophones, &c. Directors: C. A. Roberts (permanent governing director), 42, Grove Way, Esher, Surrey, director of Neon Luminous Tubes (Lund Signs), Ltd., and Wm. A. A. Ballard, "The Timbers," Hopton Road, Streatham, S.W.16. Registered office: 55, Bendon Valley, Earlsfield, S.W.18.

**Television Development (U.K.), Ltd.**—Private company. Registered May 25th. Capital, £100. Objects: To manufacture and deal in television, radio, gramophone, cinema, picture projecting or voice producing equipment or sets, &c. Subscribers: W. S. Gibson, 133, Dukes Avenue, Muswell Hill, N.10; and R. Banks, 43, Rylett Crescent, W.12. Solicitors: Kenneth Brown, Baker, Baker, Essex House, Essex Street, W.C.2.

## Companies' Returns

### Statements of Capital

**Artic Fuse & Electrical Manufacturing Co., Ltd.**—Capital, £5,000 in 4,700 ordinary and 100 deferred ordinary shares of £1 and 4,000 founders' shares of 1s. Return dated December 31st, 1938 (filed March 9th, 1939). 2,683 ordinary, 100 deferred ordinary and 2,183 founders' shares taken up. £2,079 13s. paid on 1,983 ordinary and 1,983 founders' shares. £812 10s. considered as paid on 700 ordinary, 100 deferred ordinary and 250 founders' shares. Mortgages and charges, nil.

**Erskine Heap & Co., Ltd.**—Capital, £50,000 in 10s. shares. Return dated March 30th, 1939. 46,489 shares taken up. £4,413 paid on 8,826 shares. £18,831 10s. considered as paid on 37,663 shares. Mortgages and charges, nil.

**Edison Swan Electric Co., Ltd.**—Capital, £432,565 8s. in 300,000 ordinary shares of £1 and 662,827 ordinary shares of 4s. Return dated March 31st, 1939. 300,000 £1 ordinary shares taken up. £231,750 paid (3s. 4d. on 56,929½ shares, 8s. on 5,283 shares and £1 on 219,470⅝ shares). £69,028 considered as paid (£1 on 18,317½ shares, 16s. 8d. on 56,929½ shares, and 12s. on 5,283 shares). £452 calls unpaid. Mortgages and charges, nil.

**Croydon Cable Works, Ltd.**—Capital, £170,000 in £1 shares. Return dated March 8th, 1939. 700 shares taken up. £700 paid. Mortgages and charges, nil.

**H. J. Cash & Co., Ltd.**—Capital, £25,000 in £1 shares. Return dated March 14th, 1939. 16,000 shares taken up. £11,000 paid. £5,000 considered as paid. Mortgages and charges, nil.

**Central London Electricity, Ltd.**—Capital, £6,914,760 in £5,306,851 ordinary stock, £1,405,000 4½ per cent. cumulative preference stock and £202,909 6 per cent. cumulative preference stock. Return dated March 21st, 1939. All stock taken up. £1,280,000 paid on £480,000 ordinary and £800,000 4½ per cent. preference stock. £5,634,760 considered as paid on the remainder. Mortgages and charges, £1,319,203.

**Keswick Electric Light Co., Ltd.**—Capital, £20,000 in 5,000 preference and 15,000 ordinary shares of £1. Return dated April 6th. 4,000 preference and 15,000 ordinary shares taken up. £13,000 paid on 13,000 ordinary shares. £6,000 considered as paid on 4,000 preference and 2,000 ordinary. Mortgages and charges nil.

**British Arc Welding Co., Ltd.**—Capital, £50,000 in £10 shares. Return dated April 10th. 1,474 shares taken up. £12,740 paid. £2,000 considered as paid. Mortgages and charges nil.

**Metropolitan-Vickers Electrical Co., Ltd.**—Capital, £250,000 in £1 shares. Return dated March 22nd, 1939. 10,002 shares taken up. £10,002 paid. Mortgages and charges, nil.

### Mortgages and Charges

**Harvey (Electrical Engineers), Ltd.**—Particulars filed of £15,000 debentures, authorised May 16th, 1939, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

**Decca Radio & Television, Ltd.**—Particulars filed of £20,000 redeemable notes, 1949, authorised May 8th, 1939, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £8,000.

**Stenor, Ltd.**—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated May 8th, 1939, to secure £5,000. Holder: L. Steimer, 47, Kew Foot Road, Richmond, Surrey.

**Up-to-Date-Appliances, Ltd.** (formerly Midgrad, Ltd.).—Particulars filed of £2,000 debentures, authorised March 22nd, 1939, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £1,600.

**H. Beney & Sons, Ltd.**—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated May 12th, 1939 to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

### Increases of Capital

**Uxbridge and District Electric Supply Co., Ltd.**—The nominal capital has been increased by the addition of £250,000, in £1 ordinary shares, beyond the registered capital of £1,250,000. Practically all the issued shares are held by the Metropolitan Electric Supply Co., Ltd.

**Egham and Staines Electricity Co., Ltd.**—The nominal capital has been increased by the addition of £150,000, in £1 ordinary shares, beyond the registered capital of £850,000. Practically the whole of the issued ordinary shares are held by the Metropolitan Electric Supply Co., Ltd.

**Notting Hill Electric Lighting Co., Ltd.**—The nominal capital has been increased by the addition of £114,750, in £1 ordinary shares, beyond the registered capital of £335,250.

**Neon Supplies (Western), Ltd.**—The nominal capital has been increased by the addition of £3,500, in £1 ordinary shares, beyond the registered capital of £1,500.

**Halex, Ltd.**—The nominal capital has been increased by the addition of £224,900, in £1 ordinary shares, beyond the registered capital of £100. The British Xylonite Co., Ltd., was allotted 224,996 fully paid shares on December 30th, 1938.

**B.X. Plastics, Ltd.**—The nominal capital has been increased by the addition of £449,900, in £1 ordinary shares, beyond the registered capital of £100. The British Xylonite Co., Ltd., was allotted 449,994 fully paid shares on December 30th, 1938.

## Reports and Dividends

**Edmundsons Electricity Corporation, Ltd.,** held its annual meeting on Wednesday last when Sir Thomas Royden (chairman), who presided, said that during the past year, in pursuance of the policy of co-ordinated control, eighteen separate subsidiary and sub-subsidiary companies had completed their liquidations and six subsidiary companies of the Shropshire Group were now in process of liquidation. This policy of consolidation would continue until the group would consist of Edmundsons, the parent company, and ten or possibly fewer

directly owned operating subsidiaries. During the past year 40,000 new consumers were added, bringing the total to 418,100; 210,300 kW of additional load was connected, making a total of 1,270,300 kW; and sales reached a total of 817,591,000 kWh, an increase of 81,658,000 kWh. During the first four months of 1939 the increase in the number of consumers, connected load, and kWh sent out showed a satisfactory improvement over the corresponding period of 1938.

Satisfactory progress had been made in the installation of the 225,000 kW of additional generating capacity in their selected stations, and they anticipated that the final completion of this important operation would be achieved several months earlier than the time scheduled.

After referring to the proposed reorganisation of the electricity supply industry, the chairman said that as a result of conflicting views between the industry and the Ministry of Transport relating to the exercise by the Electricity Commissioners or the Minister of control over the terms and form of new capital requirements of all statutory companies they were confronted with a serious difficulty. Their Wessex Company had been expanding rapidly during the past few years and as a result of large expenditure involved found itself last October in the position of having reached the limit of its authorised capital powers. Application was made to the Electricity Commissioners for approval of an increase of the capital of this company. The right to raise this capital was still being withheld, and they did not know when, or if, it would eventually be granted. They had been advised by eminent counsel that this arbitrary action by the authorities concerned was *ultra vires*.

**Richard Johnson & Nephew, Ltd.**—Presiding at the annual meeting on May 24th Mr. A. T. Johnson (chairman) said that in view of the conditions created by the European political situation it was only to be expected that the tonnage produced at their works during the year under review should show a distinct decline as compared with the boom period of the previous year. It was therefore gratifying to note that, if they excluded the year ended March 31st, 1938, the profit earned was very much above the level previously recorded. Consequently, they could safely infer that, as a result of the reorganisation of works, the company was now much better placed to withstand any period of depression which it might be called upon to face.

At the moment the immediate prospects appeared to be more favourable than was the case twelve months ago. One of the principal dangers with which they appeared to be confronted was that of over-production. It would be difficult to conceive a greater revolution than that which the wire trade had experienced during the last few years. Almost every process in every stage of production had been replaced by more up-to-date methods, calculated to lead to greater efficiency and increased output. Consequently, during the boom period of 1937, although some firms were worse placed than others in regard to the supplies of raw materials, the industry as a whole was fully able to cope with the increased demand.

Since that period there had been more than one newcomer into the trade and further schemes were projected. There was a strong tendency to encourage the establishment of plant, particularly by foreigners, in the distressed areas. Such action did not benefit employment, since it merely resulted in the transfer of labour from one district to another, while it disorganised the trade at a period when British industry should be organised in order to combat the State-aided competition from abroad.

With regard to the export markets, they had received intimation from New Zealand that for the first time the New Zealand Government had decided to place its general wire contract with Australia, which was aided by the exchange position giving it a 25 per cent. advantage. The loss of this section of the trade involved not only a considerable quantity of wire but also a large tonnage of British steel, and established a dangerous precedent as regards the general purchasing of British goods in the Dominion. He could not help feeling that this calamity could and should have been avoided.

The non-ferrous side of their business registered a slight improvement, primarily due to increased development in the extension of rural transmission lines. This could only be regarded as a temporary phase, while in another section the gradual change-over to motor-buses from trams would mean a further reduction in the field for their products.

**The Madras Electric Supply Corporation, Ltd.,** held its annual meeting on May 24th when Mr. J. Gray (chairman), who presided, said that although the number of consumers connected and the kWh sold during 1938 increased by 9.3 per cent. and 8.4 per cent. respectively, the revenue account improved by only 1 per cent., which was due to the reduction in tariffs granted in 1936 but which did not become fully operative until January 1st, 1937.

At the last general meeting he indicated that a further reduction was contemplated, but on April 25th the Madras Government submitted a revised list of charges which were so drastic that the directors could not acquiesce. Alternative proposals had been submitted by them, and it was hoped they would receive sympathetic consideration. If the demands of the Government became obligatory in their entirety they would have a serious effect on the revenue of the corporation.

The improved results reported last year from their holdings in the tramways were of short duration, the traffic receipts suffering through the closing of Stanley Viaduct.

**Parkinson & Cowan, Ltd.**—In the course of his speech at the annual meeting on May 25th Lt.-Col. H. W. Woodall (chairman and managing director) said that one of their subsidiaries had acquired an exclusive British Empire licence for the manufacture of a wide range of scientific equipment, extending far beyond the electricity meter field in which the subsidiary had hitherto been exclusively interested. The licence agreement would enable the company to extend its interests step by step into the manufacture of equipment such as electrical protective gear, distant gas and electricity metering systems and miscellaneous measuring and controlling instruments of many kinds. Much of this work was of a highly specialised nature, and consequently less competitive than the company's existing lines.

**The Jersey Electricity Co., Ltd.**—Presiding at the annual meeting on May 23rd Judge A. E. Dorey (chairman), in the course of his speech, said that 1,091 consumers were connected to the mains during 1938, bringing the total to 9,003, and the output had increased from 4,847,000 to 5,873,000 kWh. To meet the increased demand a new 1,150-kW Fraser and Chalmers generating set was installed during the year, and new offices and showrooms were opened.

**Peter Brotherhood, Ltd.,** report a net profit for the year ended March 31st of £81,924, as compared with £73,481 in the preceding year, and an available balance of £172,841. The final ordinary dividend is 16 per cent., less tax, making 24 per cent. for the year (same). Provision for A.R.P. requires £7,500, and special depreciation £10,000. The balance carried forward is £104,266 (against £90,917 brought in).

**Thomas de la Rue & Co., Ltd.,** in a preliminary statement, report a profit of £248,000 for the year ended March 31st as compared with £185,000 for 1937-38. It is proposed to place £90,000 to income tax and N.D.C., £50,000 to reserve, and £10,000 to plant obsolescence. The final dividend is 9 per cent., making 15 per cent. for the year, plus a cash bonus of 11 per cent., making a total of 26 per cent. For 1937-38 the dividend was 12 per cent., plus a share bonus of 10 per cent.

**Scophony, Ltd.,** reports that during the year ended March 31st it continued the technical development of its inventions, and the £36,714 shown in the balance sheet under this heading was arrived at after deduction of the amount received from the sale and hire of apparatus, including the proceeds of a Russian Government order. Patents, trade marks, equipment, development expenditure, &c., now stand in the balance sheet at £234,443. The sum of £2,196 has been advanced to the company's subsidiary, Scophony Electronics, Ltd., for the purposes of development, making a total advance to that company of £7,028. It is proposed to increase the authorised capital from £300,000 to £500,000 by the creation of 800,000 5s. shares. The present issued capital is £210,000. Meeting: June 5th.

**The Lisbon Electric Tramways, Ltd.,** reports a net profit for 1938 of £152,515, as compared with £146,046 for 1937. General and depreciation reserve receives £55,000 and the final ordinary dividend is 4½ per cent., maintaining the distribution for the year at 7½ per cent. The balance carried forward is £31,429 (against £30,775 brought in). The number of passengers carried rose from 125,864,000 to 131,088,000.

**Whitehall Electric Investments, Ltd.,** reports a net income for the year ended March 31st of £210,073, as compared with £228,680 for 1937-38, to which is added £358,053 brought in and £8,375 tax reserve not required, making £577,001. The preference dividends absorb £187,500 and £389,501 is carried forward. No ordinary dividend has been paid since that for 1932-33.

**Vactric, Ltd.,** has decided to defer the question of the payment of the dividend for the half-year to March 31st on the 6 per cent. cumulative redeemable preference shares until the accounts for the full year to September 30th are considered. The directors state that the company has suffered from the continuation of the difficult trading conditions which have prevailed in recent months. In June last year an interim dividend of 4 per cent. was paid on the ordinary shares, but it was not followed by a final dividend.

**Crompton Parkinson, Ltd.,** have announced the following dividends, less tax:—At the rate of 4 per cent. on the 8 per cent. first preference shares in respect of the six months ended March 31st; at the rate of 3 per cent. on the 6 per cent. second preference shares; and an interim dividend at the rate of 7½ per cent. actual (against 6 per cent.) on the ordinary and "A" ordinary shares in respect of the financial year ending September 30th.

**The Lothians Electric Power Co.** reports a profit for 1938 of £60,479, as compared with £55,386 for the preceding year, and after deducting interest, tax, &c., a net profit of £50,023 (against £45,907). A sum of £28,984 is placed to reserve, and the dividend for the year is 3½ per cent., tax free (against 3 per cent.), leaving £8,121 to be carried forward (against £4,932 brought in).

**The Chloride Electrical Storage Co., Ltd.,** in a preliminary statement, reports a profit for the year ended March 31st of £324,995, as compared with £435,724 for 1937-38. It is proposed to pay a final dividend of 5 per cent. and a bonus dividend of 5 per cent. on the "A" and "B" ordinary stock, making 15 per cent. for the year. The distribution for the preceding year was 20 per cent., and included a bonus of 10 per cent. Meeting: June 9th.

**Ruston & Hornsby, Ltd.,** report a profit for the year ended March 31st of £301,406 as compared with £254,876 for 1937-38. Reserves for contingencies receive £50,000 and after deducting the interim preference dividend and adding £61,800 brought in, the balance available is £301,456. The dividend on the ordinary stock for the year is 12½ per cent., less tax (against 7½ per cent.), pension reserve receives £10,000, taxation reserve £20,000, and general reserve £50,000. The balance carried forward is £55,956.

**Newton Brothers (Derby), Ltd.,** report a net profit for the year ended March 31st of £35,343, as compared with £15,858. General reserve receives £28,201 and the dividend for the year is maintained at 12½ per cent., less tax. The balance carried forward is £7,119 (against £3,557 brought in). It is proposed to issue to shareholders one fully paid ordinary share of 2s. for each share held by capitalising reserves.

**The Ebonite Container Co., Ltd.,** has declared a final ordinary dividend of 5 per cent., less tax, making 8 per cent. for the year (same).

**The National Electric Construction Co., Ltd.,** is paying a first and final dividend of 10 per cent., less tax (unchanged).

**The Tellus Super Vacuum Cleaner, Ltd.,** reports a trading profit of £203 for 1938. After writing off £474, the debit carried forward is £5,973.

**Turner & Newall, Ltd.,** are maintaining the interim and ordinary dividend at 3¾ per cent., actual, less tax.

# STOCKS AND SHARES

TUESDAY EVENING.

THE change-over from public apprehension to comparative tranquillity in public sentiment is marked nowhere more clearly than in the Stock Exchange. The Whitsun holiday's genial weather was marred by no such vague sense of war-alarms as oppressed the community at Easter. Whatever may be the reason, or reasons, that served to restore a sentiment of increased security, there is now a confidence in the public mind that finds reflection round all the markets in the Stock Exchange. Prices are advancing under the steady pressure of investment inquiry—and purchases. It is natural, perhaps, that this should be exaggerated by the popular Press, but sober reality gladly agrees that financial conditions have taken a decided step for the better. The hypercautious, meanwhile, suggests that international politics still hold uncertainties that prompt a wonder as to where the next shock is likely to issue. Meanwhile, Home Railway stocks are forging ahead and many industrial shares show useful improvements on the week.

## Gilt-edged Popularity

The War Loan has appropriately taken the lead in a general advance amongst gilt-edged stocks. Buyers of large and small amounts have been extremely numerous. From the wider-spread and diversified character of this demand, Stock Exchange men argue that the capital which has been lying dormant, or on deposit, now feels sufficient confidence in the outlook for the money to seek a more permanent home. The Government's borrowing is thought likely to be confined for a time to short-dated loans. Stocks with definite redemption dates, of the nature of the Central Electricity and London Passenger Transport Boards, are once more in public request. A few weeks ago, they were none too easy to sell. To-day, the position is reversed: the difficulty is to find a supply, at anything like the officially-quoted prices, with which to satisfy the would-be purchasers.

## Higher Transport Fares

An eleven points rise, to 82¼, in the price of London Transport "C" stock is commentary enough on the market's reception of the decision to raise fares in the London area. The response is the more striking since the appeal had previously been regarded as having a very fair chance of success. As a result of the Railway Rates Tribunal's verdict, it is calculated that the pool into which receipts in the London area are paid will see the influx of an extra £1,179,000 in a full year. Receipts of the pool are divided in set proportions among the Board and the four main lines. Of the estimated increase, the Transport Board's share would amount to £732,000—a sum more than sufficient to bridge the gap which last year separated stockholders from the standard 5½ per cent. dividend. The new fares will come into force three weeks before the Board's year ends on June 30th. Consequently there is little expectation that the dividend declaration due in August will alter the total payment from last year's 4 per cent. Neither is opinion altogether sanguine about payment of the full 5½ per cent. twelve months later. Increasing expenditure has upset calculations on previous occasions, and, it is thought, still has to be seriously regarded. At the present price the stock yields £4 17s. per cent. on a 4 per cent. payment and £6 13s. per cent. on the full 5½ per cent. dividend.

## Home Rails

While the Transport Board takes the lion's share of the London pool of traffic receipts, the Southern Railway also puts its hand in deeply. Between them, the other three main lines would receive only £147,000 of the extra revenue; but the Southern would be entitled to a further £300,000 in a full year. This figure represents more than 1 per cent. on the company's preferred ordinary stock. The position was duly recognised by an advance in the price of that stock from 69½ to 75½—which is 27 points better than it has been earlier this year. Last year, the stock received its due 5 per cent., but the payment was not fully covered by the earnings available. The 5 per cent. preference stock, after a rise of 4 points, is at the year's highest figure. Southern Railway issues have stolen the thunder in the market this week, but those of the other lines have not failed to register satisfaction with the measure of the "Square Deal's" success, plus the mounting traffic figures. These are showing regular and substantial increases over last year's corresponding figures. Not only railway stockholders are drawing cheerful conclusions from this evidence of rising industrial activity. Iron, steel and engineering shares are firm. Vickers, at 20s. 6d., show a rise of 1s. 9d.

## Cable and Wireless

The strength of Cable and Wireless stocks shows no sign of abatement. The preference has risen 3, to 95½, and the ordinary stock, with a jump to 54½, has gained 5. Even the slow-moving 4 per cent. income stock is better at 98. Considering how rapid and substantial these recoveries have been, surprise is expressed at the negligible amount of profit-taking that has followed them. The absence of such selling, on any noticeable scale, is taken to indicate the impression that the stocks are bound for higher prices. The preference is in short supply. As a useful mixer with higher-class securities, Cable and Wireless 5½ per cent. preference is now entitled—on the last-published results—to claim a high place, and optimism does not seem unreasonable in looking for the price gradually to get into three figures. As (and if) this happens, the ordinary stock will advance in sympathy.

## Crompton Parkinson Dividend

Probably the rise in the price of Crompton Parkinson ordinary shares from 17s. 6d. to 20s. has more to do with general market conditions than with the announcement of a 7½ per cent. interim dividend. The latter leaves shareholders little the wiser as to what the year's total is likely to be. According to the company's intentions, the ordinary dividend rate will settle down at a regular 15 per cent., supplemented by such cash bonuses as circumstances shall justify. On a 15 per cent. dividend the yield on the shares, at to-day's price, would be no more than 3¾ per cent. Estimates vary a good deal as to the size of the cash bonus which, this yield suggests, will be expected at the end of the year. An extra 5 per cent. added to the 15 per cent dividend would make the yield 5 per cent.

## Electricity Supply

Making every allowance for the fullness of the Government's hands at the present time, the exasperation of electricity supply shareholders appears to grow no less over the absence of any settled policy concerning the reorganisation of the industry. Three years have passed, it is being pointed out, since publication of the McGowan Committee's well-received report; and more than two years since the Government's much and widely condemned—and subsequently discarded—interpretation of it. At a much later date, the appointment of a House of Lords Select Committee to investigate the position of holding companies seemed to suggest that action was stirring. Now comes news of the adjournment of the Committee until November. Delay and uncertainty are held to be a drag on the industry and to be of concern to electrical manufacturers as well. Meanwhile, of course, the electrical industries manage to put up a very good performance, and the electricity supply shares retain their place among gilt-edged industrials. The past week has seen a further hardening of prices, particularly in the case of Midland Counties, at 38s., and Bournemouth & Pooles, at 65/-.

## Chloride Electrical Results

Although the Ever Ready Company's results for 1938 had already opened eyes to the difficulties of the electric battery manufacturers, the ordinary shares of Chloride Electrical Storage fell 10s., to 3¼, on news of the lower distribution and profits. The dividend is maintained at the regular rate of 10 per cent., but the bonus is halved at 5 per cent. According to the preliminary figures, profits have fallen by £110,000 to £325,000. While 5 per cent. less than for 1937, the distribution is the same as that paid in the three previous years. In anticipation of the full report, it is surmised that price conditions in the industry have had a good deal to say in the financial results of the company. After the fall in price, the shares show a yield of little more than 4½ per cent. on the 15 per cent. distribution.

## Argentine Transport

Events are stirring in connection with the Buenos Ayres Transport Corporation, in which there is considerable British interest through the Anglo-Argentine Tramway and B. A. Lacroze Tramway issues. Fifteen months ago the Anglo-Argentine concern reorganised the capital in accordance with the scheme by which the undertakings were exchanged for stock in the new Corporation. Now the Buenos Ayres Corporation is reported to be placing new debenture stock in London and on the Continent. The object is thought to be the solution of an outstanding problem by the acquisition of the local omnibuses and "collectivos," which are entitled to demand cash instead of stock for their expropriation. The consequent revival of interest is chiefly centred on the debenture issues, among which the 4 per cent. first stock has changed hands up to 38; the first preference shares of £5 each are 1s. 3d. better at 7s. 6d. Eventually it is hoped that 7 per cent. will be paid on the Transport Corporation's stock. Such a return would provide Anglo-Argentine Tramways with revenue sufficient to meet the debenture interest in full, and to pay 4 per cent. on the preferred and 2½ per cent. on the ordinary shares.

## Brazilian Traction

Conditions in South America have lately received more interest than usual by reason of the remoteness of the Continent from European complexities. It can hardly be said that any noticeable activity is astir in the securities of the companies operating in the South American countries, but prices of various stocks and shares are rising under the influence of a little buying and an increased number of inquiries. In addition to Anglo-Argentine Tramways shares, Brazilian Tractions are in the limelight on a vague impression that Brazil may deem it discreet to meet her coupon-obligations upon Brazilian loans issued in the U.S.A. The Brazilian Traction is a Canadian concern, its shares popular, however, in America, and to-day's supporters hope that the company will be able to obtain sufficient exchange to permit payment of a dividend which, according to estimates, the Brazilian Traction would have no difficulty in distributing if it were able to get the money out of the country.

# ELECTRICAL COMPANIES' SHARES

## Prices, Dividends and Yields

| Company | 1939 High-est | 1939 Low-est | Dividend Pre-vious | Dividend Last | Price May 30 | Rise or Fall | Yield £ s. d. |
|---|---|---|---|---|---|---|---|
| **Home Electricity Companies** | | | | | | | |
| Bournemouth and Poole | 68/3 | 63/9 | 15 | 15 | 65/– | +⅛ | 4 12 4 |
| British Power & Light | 30/9 | 26/– | 7 | 7 | 28/6 | — | 4 18 3 |
| City of London | 33/9 | 31/– | 7½ | 7½ | 32/– | — | 4 2 6 |
| Clyde Valley | 37/9 | 34/– | 8 | 8 | 37/6 | +⅛ | 4 8 2 |
| County of London | 46/9 | 41/9 | 10½ | 10½ | 44/6 | +6d. | 4 14 2 |
| Edmundson's: | | | | | | | |
| 7% Pref. | 31/6 | 30/– | 7 | 7 | 31/– | — | 4 10 4 |
| Ord. | 27/9 | 23/– | 9 | 6 | 25/– | +6d. | 4 16 0 |
| Elec. Dis. Yorkshire | 41/6 | 37/9 | 9 | 9 | 38/9 | — | 4 12 9 |
| Elec. Fin. and Securities | 47/9 | 45/– | 12½ | 12½ | 47/6 | — | 5 5 3 |
| Elec. Supply Corporation | 51/9 | 48/– | 12 | 12 | 47/– | — | 5 2 0 |
| Isle of Thanet | 20/– | 18/6 | 4 | 4 | 18/6 | — | 4 6 6 |
| Lancs Light and Power | 34/6 | 29/– | 7½ | 7½ | 31/3 | — | 4 16 0 |
| Llanelly Elec. | 22/6 | 21/– | 5½ | 5½ | 21/– | — | 5 4 9 |
| Lond. Assoc. Electric | 29/3 | 26/3 | 7 | 7 | 26/3 | — | 5 6 8 |
| London Electric | 34/3 | 32/– | 7 | 7 | 33/– | — | 4 4 10 |
| London Power Deb. Red. | 106½ | 102½ | 5 | 5 | 102½ | — | 4 17 6 |
| Metropolitan | 51/– | 45/3 | 12 | 12 | 47/6 | +6d. | 5 1 0 |
| Midland Counties | 38/9 | 34/– | 8 | 8 | 38/– | +1/– | 4 4 3 |
| Mid. Elec. Power | 41/9 | 38/3 | 8 | 9 | 38/9 | — | 4 13 0 |
| Newcastle Elec. | 28/9 | 26/6 | 7 | 7 | 27/– | — | 5 3 8 |
| North Eastern Electric: | | | | | | | |
| Ordinary | 32/3 | 28/6 | 7 | 7 | 30/– | +1/– | 4 13 4 |
| 7% Pref. | 32/6 | 30/– | 7 | 7 | 31/6 | +6d. | 4 9 0 |
| Northampton | 48/– | 45/– | 10 | 10 | 47/6 | — | 4 4 2 |
| Notting Hill 6% Pref. (£10) | 13½ | 13 | 6 | 6 | 13 | — | 4 12 4 |
| North Met. Elec.: | | | | | | | |
| Ordinary | 46/6 | 41/6 | 10 | 10 | 44/6 | +9d. | 4 10 0 |
| 6% Pref. | 29/– | 27/6 | 6 | 6 | 27/6 | — | 4 7 3 |
| Richmond Elec. | 29/– | 27/3 | 7 | 7 | 27/6 | — | 5 1 10 |
| Scottish Power | 38/9 | 33/9 | 8 | 8 | 35/– | — | 4 11 5 |
| Southern Areas | 22/9 | 19/6 | 4½ | 5 | 20/6 | +6d. | 4 17 7 |
| South London | 30/9 | 28/– | 7 | 7 | 28/– | — | 5 0 0 |
| West Devon | 23/3 | 22/6 | 5 | 5 | 22/6 | — | 4 9 0 |
| West Glos. | 21/3 | 18/– | 2 | 2½ | 18/6 | — | 2 14 1 |
| Yorkshire Elec. | 38/6 | 34/9 | 8 | 8 | 37/– | +6d. | 4 6 6 |
| **Overseas Electricity Companies** | | | | | | | |
| Atlas Elec. | 4/3 | 2/– | Nil | Nil | 2/9 | — | — |
| Calcutta Elec. | 39/– | 34/6 | 10* | 10* | 34/6 | — | — |
| Cawnpore Elec. | 34/6 | 28/3 | 10 | 10 | 28/3 | — | 7 1 7 |
| East African Power | 26/3 | 22/6 | 7 | 7 | 24/– | — | 5 16 8 |
| Jerusalem Elec. | 24/6 | 23/3 | 5 | 6 | 24/– | — | 5 0 0 |
| Kalgoorlie (10/–) | 10/6 | 9/6 | 7½ | 7 | 10/3 | — | 7 6 4 |
| Madras | 31/– | 28/6 | 8* | 8* | 26/3 | — | 5 6 2 |
| Montreal Power | 34½ | 31 | 1½ | 1½ | 34 | +½ | — |
| Palestine Elec. "A" | 29/6 | 26/3 | 7½* | 7½* | 26/3 | −9d. | 5 14 1 |
| Perak Hydro-electric | 18/9 | 15/– | 7 | 6 | 15/– | — | 8 0 0 |
| Shawinigan Power | 23½ | 20 | 85cts. | 83cts. | 21½ | −¾ | — |
| Tokyo Elec. 6% | 61 | 50 | 6 | 6 | 51½ | — | 11 13 0 |
| Victoria Falls Power | 72/– | 60/– | 12 | 13½ | 68/9 | +⅛ | 3 18 6 |
| Whitehall Investments Pref. | 19/6 | 16/– | 7½ | 7½ | 17/6 | +6d. | 8 11 6 |
| **Public Boards** | | | | | | | |
| Central Electricity: | | | | | | | |
| 1950–70 | 112 | 106 | 5 | 5 | 108½ | — | 4 12 2 |
| 1955–75 | 115½ | 108 | 5 | 5 | 109 | — | 4 11 9 |
| 1951–73 | 106½ | 103½ | 4½ | 4½ | 105½ | — | 4 5 4 |
| 1963–93 | 95½ | 86 | 3½ | 3½ | 89 | — | 4 1 5 |
| London Elec. Trans. Gtd. | 88½ | 84 | 2½ | 2½ | 86½ | — | 2 17 6 |
| London & Home Counties, | | | | | | | |
| 1955–75 | 107½ | 106½ | 4½ | 4½ | 107 | — | 4 4 1 |
| Lond. Passenger Transport: | | | | | | | |
| A | 114½ | 104¾ | 4½ | 4½ | 108½ | +2 | 4 3 0 |
| B | 117½ | 105 | 5 | 5 | 112½ | +3 | 4 9 0 |
| C | 83½ | 64½ | 4½ | 4 | 82½ | +11 | 4 17 0 |
| West Midlands Joint Elec., | | | | | | | |
| 1948–68 | 112½ | 109 | 5 | 5 | 108½ | — | 4 12 2 |
| **Telegraph and Telephone** | | | | | | | |
| American Tel. & Tel. | 180 | 159 | 9 | 9 | 176½ | +2 | 5 2 0 |
| Anglo-Am. Tel.: | | | | | | | |
| Pref. | 101½ | 89½ | 6 | 6 | 93½ | +1 | 6 8 4 |
| Def. | 23⅜ | 19 | 1½ | 1½ | 21½ | +½ | 7 2 10 |
| Anglo-Portuguese | 24/– | 19/9 | 8 | 8 | 21/3 | — | 7 10 7 |
| Cable & Wireless: | | | | | | | |
| 5½% Pref. | 95½ | 75 | 4½ | 5½ | 95½ | +3 | 5 15 2 |
| Ord. | 55 | 34 | 4 | 4 | 54½ | +5 | 7 6 10 |
| Income | 100 | 95½ | — | — | 98 | +1 | 4 1 8 |
| Canadian Marconi $1 | 5/3 | 3/9 | — | Nil | 4/9 | +3d. | — |
| Globe Tel. & Tel.: | | | | | | | |
| Ord. | 30/– | 23/6 | 5½* | 7½* | 30/– | — | 5 0 0 |
| Pref. | 26/9 | 23/3 | 6 | 6 | 25/– | — | 4 16 0 |
| Great Northern Tel. (£10) | 38 | 27½ | 20 | 20 | 32½ | −1 | 6 3 1 |
| Inter. Tel. & Tel. | 10½ | 7½ | Nil | Nil | 8 | +½ | — |
| Marconi-Marine | 29/– | 23/– | 7½ | 10 | 28/3 | — | 7 1 6 |
| Oriental Telephone Ord. | 2½ | 46/3 | 12* | 12* | 2 7/16 | — | 4 16 0 |
| Radio Corpn. | 8⅞ | 6 | 8 | 6 | 7 | — | — |
| Telephone Props. | 14/– | 12/9 | 5 | 6 | 13/9 | — | 8 14 6 |
| Telephone Rentals (5/–) | 10/– | 8/6 | 5 | 6 | 9/6 | +3d. | 3 3 2 |
| Western Union | 25½ | 19½ | 2½ | — | 20½ | — | — |
| **Traction and Transport** | | | | | | | |
| Anglo-Arg. Trams: | | | | | | | |
| First Pref. (£5) | 7/6 | 3/6 | Nil | Nil | 7/6 | +⅛ | — |
| 4% Inc. | 16 | 7 | Nil | Nil | 13 | — | — |
| British Electric Traction: | | | | | | | |
| Def. Ord. | 1025 | 700 | 5 | 5 | 1025xd. | +75 | — |
| Pref. Ord. | 164 | 158 | 8 | 8 | 150xd. | — | 5 6 8 |
| Bristol Trams | 48/6 | 37/3 | 8 | 10 | 47/6 | +¼ | 4 4 3 |
| Brazil Traction | 13 | 7⅞ | $1 | — | 11 | — | — |
| Calcutta Trams | 25/6 | 23/6 | 8 | 8 | 23/– | — | 6 19 2 |
| Cape Elec. Trams | 18/– | 16/9 | 5 | 6 | 17/6 | — | 6 17 2 |
| Lancs Transport | 36/6 | 32/6 | 10 | 10 | 32/6 | — | 6 3 1 |
| Mexican Light: | | | | | | | |
| 1st Bonds | 25 | 21 | 5 | 5 | 25 | — | — |
| Rio 5% Bonds | 81 | 47 | 5 | 5 | 70 | — | 7 2 10 |
| Southern Rly: | | | | | | | |
| 5% Prefd. | 75½ | 48 | 5 | 5 | 75½ | +6 | 6 12 5 |
| 5% Pref. | 98½ | 80 | 5 | 5 | 98½ | +5 | 5 1 6 |
| T. Tilling | 48/3 | 39/6 | 10 | 10 | 48/3 | +2/– | 4 3 0 |
| Tilling & B.A. | 53/– | 50/– | 10 | 9* | 52/6 | — | 3 8 7 |
| West Riding | 37/9 | 31/3 | 10 | 10 | 36/3 | +¼ | — |
| **Equipment and Manufacturing** | | | | | | | |
| Aron Electricity Ord. | 32/3 | 28/9 | 15 | 15 | 28/9 | — | 10 0 0 |
| Assoc. Elec.: | | | | | | | |
| Ord. | 45/3 | 34/9 | 10 | 10 | 39/– | +6d. | 5 2 7 |
| Pref. | 36/6 | 34/– | 8 | 8 | 33/9 | — | 4 11 10 |
| Automatic Telephone & El. | 46/6 | 39/3 | 10 | 12½ | 46/3 | +⅛ | 5 8 3 |
| Babcock & Wilcox | 42/9 | 37/– | 10 | 12½ | 44/6 | — | 5 13 1 |
| British Aluminium Ord. | 58/3 | 48/9 | 12½ | 12½ | 58/3 | +9d. | 4 6 0 |
| British Insulated Ord. | 88/– | 77/– | 20 | 20 | 4⅛ | — | 4 18 6 |
| British Thermostat (5/–) | 16/– | 12/– | 18½ | 18½ | 13/3 | — | 6 19 7 |
| British Vacuum Cleaner(5/–) | 22/6 | 18/6 | 40 | 40 | 16/3 | −½ | — |
| Brush Ord. | 5/9 | 4/6 | Nil | Nil | 5/– | — | — |
| Callender's | 92/– | 67/6 | 20 | 15 | 67/6xd. | +⅛ | 4 8 8 |
| Chloride Elec. Storage | 82/3 | 65/– | 20 | 15 | 3½ | −½ | 4 12 4 |
| Consolidated Signal | 96/– | 80/9 | 36½ | 36½ | 82/6 | — | 8 16 9 |
| Crabtree (10/–) | 25/6 | 21/6 | 17½ | 17½ | 22/6 | — | 7 15 7 |
| Crompton Parkinson: | | | | | | | |
| Ord. (5/–) | 21/– | 14/9 | 12½ | 15 | 20/– | +½ | — |
| E. K. Cole (5/–) | 9/– | 4/– | 5 | 10 | 5/6 | +3d. | 9 1 10 |
| Elec. & Musical Industries | | | | | | | |
| (10/–) | 14/9 | 8/9 | 10 | 5 | 11/3 | — | 4 9 0 |
| Electric Construction | 38/6 | 30/6 | 10 | 12½ | 37/6 | — | 6 13 4 |
| Enfield Cable Ord. | 58/6 | 2½ | 25 | 16½ | 52/6 | +½ | 6 3 10 |
| Electrical Switchgear (10/–) | 27/– | 23/9 | 16 | 16 | 23/9 | — | 6 14 9 |
| English Electric | 36/– | 30/3 | 10 | 10 | 35/3 | +⅛ | 5 13 6 |
| Ensign Lamps (5/–) | 14/6 | 13/9 | — | 25 | 14/6 | +6d. | 8 12 4 |
| Ericsson Tel. (5/–) | 43/– | 35/– | 25* | 25* | 41/3 | — | 3 0 6 |
| Ever Ready (5/–) | 24/– | 19/3 | 35 | 30 | 19/6 | — | 7 14 0 |
| Falk Stadelmann | 27/– | 22/6 | 10 | 10 | 22/6 | — | 8 18 0 |
| Ferranti Pref. | 25/6 | 23/6 | 7 | 7 | 23/– | −1 | 6 1 9 |
| G.E.C.: | | | | | | | |
| Pref. | 31/9 | 29/3 | 6½ | 6½ | 28/9 | — | 4 10 6 |
| Ord. | 82/– | 70/9 | 17½ | 20 | 80/– | — | 5 0 0 |
| Greenwood & Batley | 27/6 | 24/6 | 7 | 15 | 26/3 | — | 11 8 2 |
| Hall Telephone (10/–) | 22/3 | 19/3 | 15 | 15 | 21/3 | — | 7 1 2 |
| Henley's (5/–) | 21/– | 17/9 | 20 | 20 | 18/9 | — | 5 6 8 |
| 4½% Pref. | 23/– | 21/6 | 4½ | 4½ | 22/6 | — | 4 0 0 |
| Hopkinsons | 46/3 | 37/3 | 12½ | 15 | 46/3 | +⅛ | 6 9 10 |
| India-Rubber Pref. | 21/– | 20/– | 5½ | 5½ | 21/3 | — | 5 3 6 |
| Intl. Combustion | 117/– | 97/– | 32½ | 32½ | 5⅝ | — | 5 17 0 |
| J. Lucas | 60/– | 52/– | 15 | 15 | 57/6 | — | 5 4 4 |
| Johnson & Phillips | 41/– | 32/– | 12½ | 12½ | 37/6 | — | 6 13 6 |
| Lancashire Dynamo | 68/– | 60/– | 25 | 25 | 60/– | — | 8 6 8 |
| Laurence Scott (5/–) | 12/– | 10/– | 15 | 15 | 11/– | +3d. | 6 16 4 |
| London Elec. Wire | 31/6 | 29/– | 12 | 7½ | 29/6 | — | 5 1 8 |
| Mather & Platt | 50/– | 42/6 | 13½ | 13½ | 47/6 | +⅛ | 5 17 0 |
| Metropolitan Elec. Cable Pf. | 21/3 | 21/– | 5½ | 5½ | 21/3 | — | 5 3 6 |
| Murex | 85/9 | 63/9 | 20 | 20 | 4⅛ | +⅛ | 4 18 6 |
| Pye Deferred (5/–) | 13/9 | 7/6 | 5 | 25 | 10/6 | +6d. | 11 18 2 |
| Revo (10/–) | 35/6 | 31/– | 12 | 17½ | 31/– | −2/9 | 5 13 0 |
| Reyrolle | 61/– | 52/6 | 12½ | 12½ | 56/3 | — | 4 9 0 |
| Siemens Ord. | 26/9 | 20/6 | 7½ | 7½ | 25/– | +⅛ | 6 0 0 |
| Strand Elec. (5/–) | 5/6 | 4/9 | 5 | 10 | 5/– | — | 10 0 0 |
| S. Smith (1/–) | 9/9 | 6/– | 37½ | 50 | 8/9 | — | 5 14 3 |
| Switchgear & Cowans (5/–) | 15/– | 11/3 | 20 | 20 | 11/3 | — | 8 18 0 |
| Telegraph Condenser (10/–) | 7/6 | 5/– | 5 | — | 7/6 | — | — |
| Telegraph Construction | 2½ | 37/6 | 10 | 10 | 37/6 | — | 5 6 8 |
| Telephone Mfg. (5/–) | 10/– | 8/– | 9 | 9 | 9/– | — | 5 0 0 |
| Tube Investments | 91/– | 82/9 | 23¾ | 23¾ | 90/6 | +2/3 | 5 6 2 |
| Vactric (5/–) | 4/3 | 2/3 | 10 | 4 | 2/6 | −6d. | 8 0 0 |
| Vickers (10/–) | 24/6 | 19/6 | 10 | 10 | 20/6 | +1/9 | 4 17 7 |
| Westinghouse Brake | 54/9 | 43/9 | 17½ | 17½ | 46/3 | — | 7 11 4 |
| Walsall Conduits (4/–) | 31/9 | 24/– | 55 | 55 | 27/– | — | 8 3 0 |
| West, Allen (5/–) | 7/6 | 5/9 | 7½ | 10 | 6/6 | +3d. | 7 13 10 |

* Dividends are paid free of Income Tax.

# NEW PATENTS

## Electrical Specifications Recently Published

*Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

**1937.**

21305. "Wire-gripping devices, particularly for use in electrical connectors, wire-fencing equipment, wiring machines and the like." D. Wallis and S. E. Grubb. July 31st, 1937. (504915.)

24235. "Wireless apparatus." W. A. Beatty. September 4th, 1937. (505170.)

26424. "Electric filters." Allgemeine Elektricitäts-Ges. September 29th, 1936. (Cognate application 26425/37.) (504830.)

26796. "Wireless transmission or receiving apparatus." A. D. Blumlein. October 4th, 1937. (505079.)

26797. "DC voltage-changing apparatus." E. L. C. White. October 4th, 1937. (505080.)

26867. "Electric switches employing mercury or other conducting liquids." A. Cianchi. October 4th, 1937. (505082.)

26951. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., L. J. Davies, H. Cheney and H. K. Bourne. October 5th, 1937. (505172.)

29235. "Electric current supply arrangements." Telefunken Ges. für Drahtlose Telegraphie. October 26th, 1936. (504923.)

29380. "Electrical condensers." A. H. Hunt, Ltd., and J. H. Fisher. October 27th, 1937. (Cognate application 2309/38.) (504926.)

29426. "Electrodes for use in electron multipliers and electron multipliers embodying such electrodes." J. D. McGee. October 28th, 1937. (Cognate application 33884/37.) (504927.)

29762. "Electric generators." J. H. Holmes & Co., Ltd., A. C. Fenwick and J. W. Bayles. November 1st, 1937. (505088.)

29864. "Manufacture of welding electrodes and electric make-and-break switch contacts." Naamlooze Vennootschap Molybdenum Co. November 12th, 1936. (Addition to 456018.) (505017.)

29885. "Electric sign." B. E. Tyerman. November 2nd, 1937. (504831.)

29893. "Liquid-immersed electric circuit-breakers." Electric Construction Co., Ltd., and J. M. Boyd. November 2nd, 1937. (504832.)

29984. "Direct-current electric generators." General Electric Co., Ltd., and E. C. Davies. November 2nd, 1937. (505246.)

30037. "Relaxation oscillation generators." C. L. Faudell. November 3rd, 1937. (505022.)

30049. "Insulated rail joint." J. H. Condy, A. N. Brogden, and London Passenger Transport Board. November 3rd, 1937. (505025.)

30057. "Electric-discharge devices and/or circuits therefor." A.C. Cossor (Holdings), Ltd., and B. C. Fleming-Williams. November 3rd, 1937. (505026.)

30103. "Electric switches and controllers." Partridge Wilson & Co., Ltd., A. R. Hardwick and F. G. Sawyer. November 3rd, 1937. (505249.)

30105. "Thermionic amplifiers." Rediffusion, Ltd., and P. Adorjan. November 3rd, 1937. (505030.)

30109. "Television receivers." Telefunken Ges. für Drahtlose Telegraphie. November 3rd, 1936. (505031.)

30111. "Detecting and measuring arrangements for high-frequency electric currents." Telefunken Ges. für Drahtlose Telegraphie. November 3rd, 1936. (504836.)

30145. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd., G. F. Brett and E. O. Smith. November 3rd, 1937. (505035.)

30146. "Tuning arrangements for radio transmitters." Marconi's Wireless Telegraph Co., Ltd., and T. D. Parkin. November 3rd, 1937. (505036.)

30150. "Telephone systems." J. E. Pollak (Associated Telephone & Telegraph Co.) November 3rd, 1937. (505037.)

30168. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., C. Gilson, H. K. Bourne and W. J. Scott. November 3rd, 1937. (505096.)

30179. "Cathode-ray tubes." Fernseh Akt. Ges. November 3rd, 1936. (505039.)

30192. "Electrical oscillation generators." W. S. Percival. November 4th, 1937. (505252.)

30342. "Electric soldering-irons." W. Allday & Co., Ltd., E. W. Allday and F. G. Hancock. November 5th, 1937. (504838.)

30404. "Apparatus for X-ray photography having a scattered ray grid diaphragm." G. Grossmann. November 5th, 1936. (505260.)

30406. "Telephone installations." Autophon Akt. Ges. November 5th, 1936. (505192.)

30414. "Protective control of mercury-arc rectifiers." British Thomson-Houston Co., Ltd., and C. J. Sarjeant. November 5th, 1937. (505116.)

30419. "Photo-electric exposure meters." S. F. Warren (Mettrawatt Akt. Ges.). November 5th, 1937. (505195.)

30422. "Electrical means for controlling the passage of materials through hoppers." G. W. King, Ltd., and D. M. King. November 5th, 1937. (505261.)

30439. "Electric cooking and like apparatus." Simplex Electric Co., Ltd., and P. W. Davis. November 5th, 1937. (505117.)

30445. "Television and like systems." Baird Television, Ltd., G. Dovaston and G. E. G. Graham. November 5th, 1937. (505197.)

30578. "Electric cable-terminating devices." Pirelli-General Cable Works, Ltd., and R. E. Horley. November 8th, 1937. (505041.)

30700. "Variable thermionic impedance networks." E. K. Cole, Ltd., and G. Bradfield. November 9th, 1937. (505124.)

30765. "Electric transformers." British Thomson-Houston Co., Ltd. November 11th, 1936. (505215.)

31060. "Electric circuits for operating electric-discharge devices." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) November 11th, 1937. (505044.)

31150. "Electric conduit fittings." E. P. S. Cattle. November 12th, 1937. (505217.)

31336. "Electrical apparatus for heating rooms, cabins, buildings and like." General Electric Co., Ltd., and G. S. Cattell. November 15th, 1937. (505220.)

32307. "Electrical plug-and-socket connectors." C. H. Parsons, Ltd., and G. B. Handley. November 24th, 1937. (505129.)

33321. "Electric storage batteries." G. V. Lateulere. December 2nd, 1937. (505048.)

33550. "Illuminated electric clocks." A. L. Rawlings. December 3rd, 1937. (504847.)

35504. Electric transmission of alphabetical, numerical, and like characters." C. Lorenz Akt. Ges. December 22nd, 1936. (505051.)

**1938**

965. "Audio-frequency thermionic amplifiers." Ferranti, Ltd., N. H. Searby and G. I. Thomas. January 12th, 1938. (504960.)

3811. "Television or telecinema transmitters." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. February 8th, 1937. (505057.)

5028. "Circuits for the production of saw-tooth oscillations of constant frequency and more especially for electrical musical instruments." F. Trautwein. February 17, 1937. (504966.)

5218. "Electro-magnetic induction gauges for measuring the thickness or other characteristics of a metallic material by determining its electrical conductance. British Thomson-Houston Co., Ltd. February 19th, 1937. (505132.)

8248. "Cathode disintegration apparatus with insulated lead-in device. B. Berghaus. March 25th, 1937. (Cognate applications 8249/38, 8250/38, 8251/38 and 8252/38.) (505137.)

13947. "Secret electric signalling system." Standard Telephones & Cables, Ltd. June 23rd, 1937. (504861.)

15791. "Supply arrangements for radio receiving sets." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 29th, 1937. (504866.)

18283. "Circuit arrangements for electric-discharge devices." British Thomson-Houston Co., Ltd. June 19th, 1937. (505143.)

18419. "Arrangement for the translation of impulse combinations, particularly for printing-telegraph receivers." Siemens & Halske Akt. Ges. June 22nd, 1937. (504984.)

18442. "Electrical apparatus for measuring small movements." Askania-Werke Akt. Ges. June 21st, 1937. (505242.)

18919. "Process for the manufacture of electric lamp bases from hard glass or quartz glass and incandescent lamps incorporating bases made by such a process." Vereingte Glühlampen und Elektrizitäts. June 25th, 1937. (504874.)

21599. "Electro-metrical measuring apparatus, preferably for pH measurements." Fides Ges. für die Verwaltung und Verwertung von Gewerblichen Schutzrechten. September 18th, 1937. (504989.)

22258. "Electric system for transmitting rotary motion." W. J. Tennant (Anschutz & Co., Ges.). July 26th, 1933. (504991.)

28858. "Time measuring apparatus with a synchronous motor and an auxiliary movement." Landis & Gyr Akt. Ges. September 6th, 1937. (504878.)

24155. "Electric motors." Utah Radio Products Co. October 15th, 1937. (505152.)

24829. "Electric switches with automatic trip mechanism." Patentverwertungs Ges. Hermes. August 26th, 1937. (505153.)

26383. "Transmission systems." Standard Telephones & Cables, Ltd. October 5th, 1937. (504887.)

26691. "Apparatus for making tubes from band iron by electric welding." Neunkircher Eisenwerk Akt. Ges. vorm. Geb. Stumm. November 13th, 1937. (504889.)

28593. "Electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 4th, 1937. (504893.)

28666. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. October 5th, 1937. (504998.)

29160. "Electro-optical systems for television image transmission." Electrical Research Products, Inc. October 15th, 1937. (504898.)

**1939**

3119. "Television transmission." Radioakt. Ges. D. S. Loewe. October 2nd. 1936. (Divided out of 503207.) (505167.)

# TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered with in one month from May 24th:—

Ductolend. No. 601896. Class 9 (IV). Electric arc welding apparatus and electrodes therefor.—La Société la Soudure Electrique Autogène, Brussels, Belgium. (British representatives: Gill, Jenning and Every, 51-52, Chancery Lane, W.C.2.)

Wincharger (lettering and design). No. 603518. Class 9 (IV). Primary and secondary electric cells, wireless apparatus and television apparatus.—Wincharger Corporation, Sioux City, Iowa, U.S.A. (British representatives: Lloyd Wise & Co., 10, New Court, Lincoln's Inn Fields, W.C.2.)

Telfair Telefone. No. 604723. Class 9 (IV). Intercommunication telephones.—H. F. Steckel, Skylux House, Brunel Rd., W.3.

Little Corporal. No. 606059. Class 9 (IV). Radio apparatus and parts thereof.—Namco Manufacturing Co., New York, U.S.A. (British representatives: McKenna & Co., 31-34, Basinghall Street, E.C.2.)

Minora. No. 606329. Class 9 (IV). Radio apparatus and parts thereof, electric batteries and accumulators.—Vidor, Ltd., West Street, Erith, Kent.

# CONTRACT INFORMATION

**Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders**

## Contracts Open

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.*

**Aldershot.**—July 4th. Electricity Department. One three-panel, metal-clad, 6,600-V switchboard. (See this issue.)

**Argentina.**—BUENOS AIRES.—June 16th. Oilfields Department. Electric generators and motors. (T.Y. 23047/39.)*

**Australia.**—VICTORIA.—June 27th. State Electricity Commission. V.i.r. copper cable. (T. 22826/39.)*

MELBOURNE.—July 4th. Posts and Telegraph Department. Switchboard and instrument plugs. (T. 22674/39.)*

BRISBANE.—July 11th. City Electric Light Co., Ltd. Land and submarine cables. (T. 22823/39.)*

**Belfast.**—June 2nd. Electricity Department. Saturated steam pipework and valves for the Harbour power station. (May 19th.)

**Berkshire.**—June 16th. County Council. Electric lighting installation at Newbury Public Assistance Institution. (May 26.)

**Birmingham.** — June 2nd. Electric Supply Department. Extra-high-voltage metal-clad switchgear to Spec. No. SE.99. (May 19th.)

June 12th. Four electric cranes at Hams Hall "B" power station. (May 26th.)

June 13th. Salvage Department. Nineteen electric battery-driven vehicles. General manager, 161, Corporation Street. (Deposit £1 1s.)

June 26th. Domestic electrical apparatus for twelve months. (See this issue.)

June 28th. Electro-static flue-gas cleaning plant at Hams Hall "B" power station. (See this issue.)

July 10th. Two ferro-concrete cooling towers at Hams Hall "B" power station. (May 26th.)

**Cardiff.**—July 3rd. Electricity Department. 6,600-V and 33,000-V sub-station switchgear, three 7,500-kVA transformers, and cable. (See this issue.)

**Cheadle and Gatley.**—June 12th. Electricity Department. Extensions to 6.6-kV switchgear at the Cheadle main sub-station. (May 26th.)

June 19th. Extensions to 6.6-kV switchgear and one 600-kVA transformer for Torkington estate sub-station. (See this issue.)

**Dublin.**—August 1st. Electricity Supply Board. Turf burning boiler plant and auxiliaries at a generating station near Portarlington, Co. Leix, also one 20/25,000-kW turbo-alternator and exciter with complete condensing and auxiliary plant. (May 19th.)

**Edinburgh.**—June 2nd. Corporation. Electrical installation at Holy Cross Academy. Town Clerk.

June 2nd. Electrical installations at Broughton Secondary, Duncan Street Special, and Gorgie schools. Town Clerk.

**Hastings.**—June 2nd. Electricity Department. Boiler fuel for twelve months. (May 19th.)

**Hawick.**—June 12th. Town Council. Electrical work at thirty houses at Havelock Street estate. Town Clerk.

**Herefordshire.**—June 10th. County Council. One bed-lift and one trolley lift at Hereford Institution. (See this issue.)

**Huddersfield.**—June 12th. Electricity Department. Complete electric goods lift installation. (May 26th.)

**India.**—SIMLA.—June 15th. Railway carriage electric fans, regulators, &c., for N.W. Railway. (T. 22948//39.)*

June 15th. 5,000 porcelain, disc cap and pin type insulators, suitable for 110-kV transmission lines. (T. 22946/39.)*

**Kirkcaldy.**—June 12th. Corporation. Electric lighting at Fergus Wynd housing estate (twelve houses). Town Clerk.

**Llandrindod Wells.**—June 8th. Electricity Department. Mercury-arc rectifier equipment. (May 26th.)

**Leeds.**—June 12th. Corporation. X-ray installation at St. James's Hospital. (May 19th.)

**London.**—H.M. OFFICE OF WORKS.—June 13th. Installation of high- and low-voltage cables and control gear at the National Physical Laboratory, Teddington. (May 26th.)

Commissioners of H.M. Works and Public Buildings. June 8th. Electrical accessories. (May 26th.)

**Newcastle-on-Tyne.** — North - Eastern Housing Association. Electrical installations in forty-four houses at Spennymoor. G. H. Gray, architect, 50, Camden Street, North Shields.

**Newport (Mon).**—June 5th. Electricity Department. Extra-high and low-voltage transmission lines for electricity supplies in the Magor rural district. (May 19th.)

June 13th. Directors. Electrical installation and equipment at the Royal Gwent Hospital.

**New Zealand.** — WELLINGTON. — June 23th. Post and Telegraph Department. 5,000-ft. of cable. (T. 22770/39.)*

June 27th. Public Works Department. Two electric cranes and two electric hoist blocks. (T. 22774/39.)*

July 4th. Four 150-kVA single-phase transformers. (T. 22772/39.)*

July 4th. Distribution switchboard for R.N.Z.A.F. Station, Blenheim. (T. 22773/39.)*

July 11th. Outdoor switchgear for 11-kV distribution lines at Waikaremoana main station. (T. 22768/39.)*

**Nottingham.**—June 13th. Electricity Undertaking. General stores for twelve months. (May 26th.)

**Plymouth.**—June 24th. Electricity Supply Department. Valve and cast-iron pipes for circulating water system, de-superheater and reducing valve equipment, high-pressure steam and water pipework and distribution switchgear, starters and motors for boiler and turbine auxiliaries. (See this issue.)

**Portslade-by-Sea.**—June 16th. U.D.C. Street-lighting installation. (See this issue.)

**Reigate.**—June 10th. Electricity Department. Four sheet-steel kiosks complete with high- and low-voltage switchgear and six 400-kVA transformers. (May 19th.)

June 10th. Extra-high voltage and low-voltage cables. (May 19th.)

June 17th. Rewinding motors, temporary plant and wiring of power circuits. (See this issue.)

**Salford.**—June 9th. Electricity Department. Samples of electrical materials. (May 26th.)

**Sellygaer.**—June 17th. U.D.C. Transformers and extra-high and low-voltage switchgear. (See this issue.)

**Stoke-on-Trent.**—June 14th. Electrical Engineer's Department. One 8-cwt. electric van. (May 26th.)

**South Africa.**—JOHANNESBURG. — July 11th. Rand Water Board. One 3,000-kW steam turbine, together with condenser and auxiliary valves and instruments, cables and wiring. (T. 22297/39.)*

July 14th. Electricity Supply Commission. 40,000-kW turbo-alternator and condensing and auxiliary plant for Congella power station. (T. 22298/39.)*

PORT ELIZABETH.—June 8th. City Electrical Engineer's Department. Low-voltage cable, house service meters, hard-drawn copper wire, house service cut-outs, transformers, metal-clad single bus-bar switch panels and slot meters. (T. 22709/39.)*

June 8th. Metal-clad double bus-bar switchboard. (T. 22586/1939.)*

CAPE TOWN.—June 14th. Electricity Supply Undertaking. Two three-phase current limiting reactors. (T. 22731/39.)*

NATAL.—June 21st. Provincial Tender Board. One electric lift at the maternity ward block, Grey's Hospital, Pietermaritzburg. (T. 22739/39.)*

**Spenborough.**—June 9th. Electricity Department. One 12-panel, 11,000-V switchboard. (May 26th.)

**Stockton-on-Tees.**—June 6th. Electricity Department. One 750-kVA and two 500-kVA transformers. (May 19th.)

**Sunderland.** — Education Committee. Installation of electric lighting in the Havelock junior and infants' school. Plans by the education architect, 4, Tatham Street.

**Tredegar.**—June 3rd. U.D.C. Automatic fire-fighting system for the Central sub-station and two manual systems for

**Uruguay.** — MONTEVIDEO. — July 19th. North and South sub-stations. (May 19th.) Electricity Works Administration. 380 lead clamping sleeves of various sizes, for wires and cables. (T. 22839/39.)*

July 20th. State Electricity Supply and Telephones Administration. 8,000 metres of underground armoured telephone cable. (T.Y. 22890/39.)*

## Orders Placed

**Birkenhead.**—Electricity Committee. Accepted for twelve months. Low-voltage switchgear.—Crompton Parkinson; G.E.C.

**Brighton.** — Corporation. Accepted. Transformer for Kemp Town sub-station. —Ferranti.

**Glasgow.**—Sub-committee on Properties. Recommended. Electric cables and fittings.—W. Geipel; British Electrical & Manufacturing Co.; G.E.C.

Police Committee. Accepted. Annual stores, including electrical fittings and accessories.—British Electrical & Manufacturing Co.; Wm. Geipel; J. Fetheringham; Revo; Wood & Cairns.

**Irvine** (AYRSHIRE).—Town Council. Accepted. Electric lighting work for Gottries Road housing estate.—J. Stuart Denholm.

**Kettering.** — Electricity Department. Accepted. One three-panel, 6,600-V, metal-clad switchboard.—Met.-Vick Elecl. Co. Two 11,000-V metal-clad switch units and one control panel.—English Electric Co.

**London.** — POPLAR. — Electricity Committee. Recommended. Mobile crane with electric drive (£1,034).—Priestman Bros.

ST. PANCRAS.—Library Committee. Recommended. Electrical fittings for Highgate library (£109).—Edison Swan Electric Co.

BERMONDSEY.—Electricity Committee. Accepted. Switchgear alterations at Neckinger station (£1,391).—A. Reyrolle & Co.

**Weymouth.** — Electricity Committee. Acepted. Turbine repairs (£3,276).—English Electric Co. Cables.—Scottish Cables (£4,892); Hackbridge Electric Construction Co. (£804). Kiosk (£346) and transformer (£209).—Bryce, Ltd.

### Luminescent Signs

In our issue of May 26th we advocated the use in industrial works of direction signs that had been treated with fluorescent powders so that they would be clearly visible after normal lighting had been extinguished. The Benjamin Electric Co., Ltd., informs us that it is manufacturing signs, ranging from 12 by 4 in. to 18 by 7 in., in which such material is fused into a vitreous enamelled surface which gives light in the form of a green luminescence for a considerable time in the dark.

# Contracts in Prospect

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

**Alnwick.**—Houses (36), at Falloden Avenue and Hillcrest; R.D.C. surveyor.

**Banbury.**—Houses (82), Ark Farm estate; Hinkins & Frewin.

**Barrow-in-Furness.**—Houses (98), and flats, Greengate Street North, for T.C.; F. L. Wooldridge, borough surveyor, Town Hall.

**Barry.**—Houses (346), three estates (£131,500); U.D.C. surveyor.

**Beckenham.** — Houses (34), Crabbs Croft, for T.C.; borough surveyor.

**Bishop Auckland.**—Textile factory, St. Helen's estate, for Messrs. Lewins; H. E. Pitt, builders, Millfield, Sunderland.

**Bishop's Stortford.** — Houses (46), Collins Cross; Turner & Riches, builders, 279, Stansted Road.

**Blaydon-on-Tyne.** — Houses (100); U.D.C. surveyor.

**Blyth.**—Houses (284), Cowpen Road, North Farm, for T.C.; T. Wilson, borough surveyor, Municipal Buildings.

**Border** (CUMBERLAND).—Houses (36), at Brampton; R.D.C. surveyor.

**Brierfield.**—Houses (64), Mansfield estate (£20,412); U.D.C. surveyor.

**Brierley Hill.**—Municipal buildings (£54,840), for U.D.C.; surveyor. Houses (64), on the Hulland housing site, Brockmoor, and 26 houses on the Wallows Street housing site, Brockmoor, for U.D.C. (£29,358); George Smith (Birmingham), Ltd., contractors, 100, Taylor Road, Birmingham, 14.

**Bromley.**—Factory and stores, Southlands Road; L. H. Kemp, architect, 10, Great James Street, London, W.C.1.

**Bromsgrove.**—Houses (40), on Uplands estate; J. H. Harris, builder, Birmingham Road.

**Corby** (NORTHANTS).—Houses (115), near Latimer Road, for Stewarts & Lloyds; Browning Bros., Leicester.

**Caernarvon.**—Houses (62), Cefnhendre estate (£27,407); borough engineer.

**Coventry.**—Senior school for trustees of the Girls' Blue Coat School (£23,033); H. Dare & Son, contractors, 962, Alum Rock Road, Birmingham.

**Desborough** (NORTHANTS). — Model bakery, Rushton Road, for Desborough Co-operative Society. Houses (12), Paddock Lane, for U.D.C.

**Dundee.**—Dwellings (504), at Lochee, for Corporation housing committee; city architect. Houses (30), Church Street, &c., Broughty Ferry, for T.C.; burgh surveyor.

**Dunfermline.**—Houses (31), Lundin Road, Crossford; D. Anderson, Crossford.

**Durham.**—Infants' school, Marley Hill, Sunniside, and school at Trimdon Grange; county architect, 34, Old Elvet. School, Shiney Row, for the C.C. (£52,000); Atlas Building & Construction Co., builders, Warrington.

**Dursley.**—Houses (40), Draycott site, Cam, for R.D.C.; F. Fitch, clerk, Council Offices, Kingshill.

**Easington.**—Houses (163), Wheatley estate (£53,518); R.D.C. surveyor.

**East Bedfont.** — Children's homes (£25,500); Middlesex county architect, 16, Great George Street, Westminster, S.W.1.

**Eastbourne.** — Extensions, Princess Alice Memorial Hospital; B. Stevens, architect.

**Ebbw Vale.**—Houses (78), Garnlyddon site, Beaufort; U.D.C. surveyor.

**Elgin.** — Houses (80-100), for T.C. (£30,000-£40,000); burgh surveyor.

**Ellesmere.**—Houses (50), for R.D.C.; W. Gough-Thomas, clerk, Bulkeley Chambers, Willow Street.

**Enfield.** — Two factories, Lockfield Avenue; P. Bilton, Ltd., 113, Park Street, London, W.1. Flats (44), Northfield Road (£13,190); Highgates (Builders), Ltd., Market Place, London, N.2.

**Essex.**—A.R.P. work at Institutions (£29,000), for P.A.C.; J. Stuart, county architect, Chelmsford.

**Freebridge Lynn.**—Houses (32), for R.D.C.; Arnold Weatherbed, clerk, 24, King Street, King's Lynn.

**Garstang.** — Reconstruction of Town Hall; F. Place, quantity surveyor, 23, South King Street, Blackpool.

**Gateshead.**—Girls' secondary school, Dryden Road, for the E.C. (£63,000); A. V. Clerey & Son, builders, 14, Frederick Street, Sunderland.

**Glasgow.**—High school for girls (£72,800); S. Cordiner, architect. New school, Pollok housing estate, for Corporation (£56,000); city architect.

**Hadley.** — Senior school (£29,512); McKeand, Smith & Co., Wolverhampton.

**Halesworth.**—Senior school (£33,410); E. Suffolk Education Committee, Ipswich.

**Halifax.**—Dwellings (64), Dobby Hall site, Haley Hill, for T.C.; borough surveyor.

**Haltwhistle** (NORTHUMBERLAND). — Maternity hospital; Oliver & Leeson, architects, 14, Ellison Place, Newcastle.

**Hanley.**—Shops and offices, Tontine Square (£22,100); C. Cornes & Son. Houses (24), Power Street; Lees & Co. Houses (68), Birches Head Road; J. Jackson.

**Harrow.**—Isolation hospital; U.D.C. surveyor.

**Hastings.**—Houses (102), Red Lake, for T.C.; S. Little, borough surveyor, 37, Wellington Square.

**Hayes** (MIDDLESEX).—School, Minet estate (£24,809); Y. J. Lovell & Son.

**Heckmondwike.**—Dale Lane junior and infants' school for the West Riding Education Committee; N. R. Paxton, architect, 34, Prudential Buildings, Park Row, Leeds.

**Holland** (LINCOLNSHIRE). — County Council Hospital at Boston; county architect, County Hall, Boston.

**Hyde** (CHESHIRE). — Houses (31), Clarendon Road and Repton Avenue, Hyde; Dean & Whipp, builders, Henry Street.

**Ilford.**—Houses (113), The Glade; Home Counties Construction Co., Three Ways, Lee Grove, Chigwell Rise, Chigwell. R.C. senior school (£26,000); Canon Palmer. Flats (218), Claybury Park estate; Bunting Construction Co., 49, Baker Street, London, W.1.

**Kelty.**—Cinema for F. Carlow and J. C. Rolland (£12,000).

**Kettering.**—Houses (400), Grange Farm estate, and (20) Gas Street; Town Council. Gymnasium block, Secondary School, for County Education Committee, Northampton.

**Kidderminster.** — Mental colony (£450,000); West Midlands Joint Board for Mentally Defectives.

**Kilmarnock.**—Houses (750) for Scottish Special Housing Association (£300,000); burgh surveyor. Houses (278), Shortlees Farm, Riccarton; Scottish Special Housing Association.

**Lanarkshire.** — Extensions (£36,800), Lanark Grammar School, for E.C.; J. Stewart, county architect, 20, Albert Street, Motherwell.

**Leamington.**—Development of estate, and cinema, Shrubland Hall site; W. Hill, builder and contractor, Hinckley.

**Liverpool.**—Offices, Prescot Road, for Britannic Assurance Co., Ltd., Broad Street Corner, Birmingham; George Platt & Sons, contractors, Westmoreland Street, Liverpool.

**London** (CRAPHAM).—Cinema (£20,000), Wandsworth Road, for Associated British Cinemas, Ltd.; W. R. Glen, architect, 30, Golden Square, London, W.1.

**Macclesfield.**—Cinema for Associated British Cinemas, London; P. L. Browne, Son & Harding, architects, Pearl Buildings, Newcastle-on-Tyne.

**Manchester.**—Houses (166), on the Parkfield estate, Swinton; J. Lane & Sons, builders, Morpeth Street, Swinton.

**Methilhill.**—Cinema for F. Carlow and J. C. Rolland (£14,000); A. L. Rolland, architect, High Street, Leven.

**Middlesbrough.**—Welfare hall, Sutton Trust Dwellings (£4,000); C. S. Errington, architect, 46, Grainger Street, Newcastle-on-Tyne.

**Morpeth** (NORTHUMBERLAND).—Extensions to Morpeth Hospital; R. Carse & Sons, contractors, Oldgate. Offices for the R.D.C.; Mauchlen & Weightman, architects, 12, Saville Row, Newcastle-on-Tyne.

**Morton.** — Senior school (£17,267); Alun Edwards & Co., Wrexham.

**Mosborough.**—Houses (65), (£24,580); Chesterfield R.D.C. surveyor.

**Northwood.**—Clinic and library, Pinner Road (£10,410); Haymills (Contractors), Ltd., Hanger Green, London, W.5.

**Oxford.**—Houses (130); F. J. Minns & Co., 67, St. Aldate's.

**Pinner.**—Houses (67), off Whitby Road, Eastcote; W.G. Estates, Ltd., Field End Road, Eastcote, Ruislip.

**Preston.**—Cinema, for Associated British Cinemas, London; P. L. Browne, Son & Harding, architects, Pearl Buildings, Newcastle-on-Tyne. Houses (116), and four shops, Pope Lane, Ribbleton, for T.C.; borough surveyor.

**Redhill** (MIDDLESEX).—Extensions to county hospital (£20,048); A. Monk.

**Rothwell.** — Houses (50), Windmill Lane Estate, Rothwell, and Robin Hood Estate, Leeds Road, for U.D.C.; F. Hartley, architect, Council Offices.

**Ruislip.** — School, Newnham Avenue (£30,337); Haymills (Contractors), Hanger Green, London, W.5.

**Seaham.**—Houses (457), at New Seaham, for the North Eastern Housing Association; P. L. Browne, Son & Harding, architects, Pearl Buildings, Newcastle-on-Tyne.

**Seaton.**—Factory, Brenda Road, for Head Wrightson's Stamping Co.

**Sheffield.**—Offices, showrooms and workshops in Bridge Street, for W. & T. Avery, Ltd., Soho Foundry, Birmingham; W. & A. Forsdike, contractors, St. Mary's Road. Houses (58), Handsworth Nurseries estate; E. Cooper, builder, Athelshaw Road.

**Shropshire.**—Central Isolation Hospital, adjoining the County Council Hospital at Cross Houses; A. G. Chant, county architect, 5, Belmont, Shrewsbury.

**Staffordshire.**—Two elementary schools, each for 350 children, on the Pheasey estate, Aldridge; G. C. Lowbridge, county education architect, County Offices, Stafford.

**Stalybridge.**—Municipal offices and extensions to existing buildings for T.C.; P. Howard, architect, 88, Mosley Street, Manchester.

**Stourbridge.**—Extensions to King Edward VI Grammar School, for board of governors (£18,000); W. T. Edwards & Sons, contractors, Audnam.

**Surbiton.**—Houses (32), Surbiton Hill Road; Bunting Construction Co., 49, Baker Street, London, W.1.

**Sutton Coldfield.**—Houses (32), Hollyhurst Road; G. E. Clarke. Fire station (£30,500), for T.C.; Councillor Lawley, chairman of Fire Brigade Committee.

**Swinton and Pendlebury.** — Central clinic, adjacent to the Town Hall, for the E.C.; H. Bennett, architect, Dales Brow.

**Tolworth.**—Houses (500), Tolworth Station estate; Hilbery, Chaplin, Ltd., 4, Russell Parade, Golders Green, N.W.11.

**Waddon** (CROYDON).—Factory, corner of Purley Way; Croydon Factory Estates, Staffa Road, Lea Bridge Road, Leyton, E.10.

**Wallsend.**—Hotel, Tynemouth Road, for Blayney & Co., Ltd.; Stanley Miller, builders, 17, North Street, Newcastle-on-Tyne.

**Watford.**—Technical college (£137,954); Herts Education Committee, Hertford.

**Wednesbury.**—Houses (45), Dale Street clearance site, for T.C.; Arthur Booth, borough surveyor, Town Hall.

**Wellington** (SHROPSHIRE). — Houses (108), Mannerley Lane, Ketley, for R.D.C.; J. Hickman & Son, architects, 1, Market Street.

**Wigan.**—Houses (36), Holme Terrace, Lessington Avenue and Danesway; G. E. Hall & Sons, Lord Street Works.

**Wolverhampton.** — School (£20,000), Pond Lane, for E.C.; borough surveyor.